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(54)

Electronic security device

(57) An electronic security device is suitable for showcases, drawers, cabinets and the like, wherein a front plate can be moved away from a storage compartment. The device comprises a locking pin that is oriented transversely to said front plate in the direction of the storage compartment. Furthermore, a magnetic valve is provided with a catch that can be retracted in lateral direction from the locking pin by an electromagnet against

the action of a spring. A selection means detects the retracted/projecting position of the catch. Guide means guide the locking pin in its reciprocating movement.

In particular, the locking pin made of a non-magnetic material houses a permanent magnet, and a detector element is fastened to the guide means for distinguishing the field of the permanent magnet without interference from elements of the field of the electromagnet that are of a low spatial order.

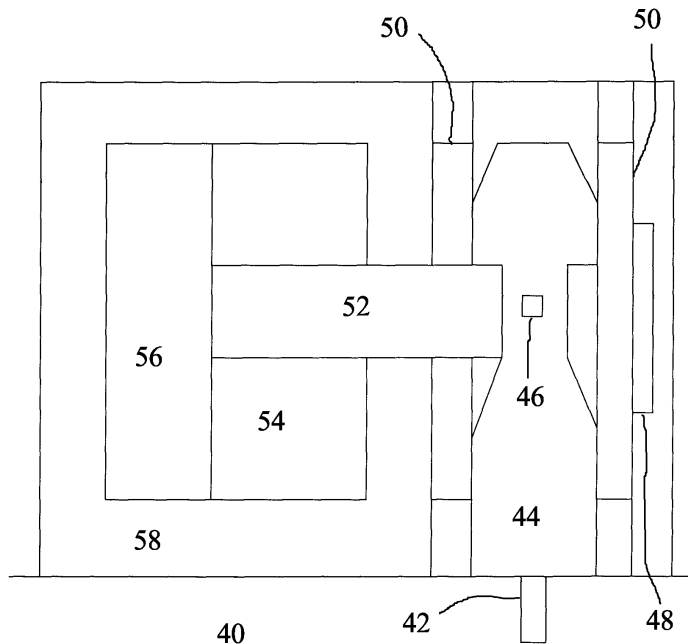


Fig. 7

## Description

**[0001]** The invention relates in general to an electronic security device suitable for display cases, drawers, cabinets, and the like in which a front plate can be moved away with respect to a storage compartment, which device comprises a locking pin that is oriented transversely to said front plate and is directed towards the storage compartment, and a magnetic valve provided with a catch for blocking a retraction of the locking pin as recited in the pre-characterizing section of claim 1. Such devices have to comply with numerous requirements. They must be lightweight and inexpensive, allow an easy opening of the cabinets etc., have a considerable strength resisting efforts to force an entry, and they must be capable of incorporation in electronic security systems at a higher level, e.g. in a battery of such cabinets.

**[0002]** In particular, the inventor has envisaged to make the detection mechanism of the presence of the locking pin, i.e. of the closed condition of the cabinet, etc., inexpensive, comparatively insensitive to malfunctions, and easy to mount. He has recognized inter alia that a metal detector for the detection of the locking pin is comparatively expensive and not very flexible when used in a design. Furthermore, it is desirable that an arrangement of the detection that is as symmetrical as possible with respect to the combination of the catch and the electromagnet avoids interference quantities of low spatial order to a substantial degree. The lowest spatial order is symmetrical with respect to the axis of symmetry of the catch, and the transverse field of the valve magnet is practically zero on this axis.

## SUMMARY OF THE INVENTION

**[0003]** It is accordingly an object of the present invention inter alia to improve a device of the kind mentioned in the opening paragraph by adding an element of the locking pin as an active, magnetic element for the presence detection.

**[0004]** The invention in one of its aspects is thus characterized in that the locking pin constructed from a non-magnetic material accommodates a permanent magnet, and in that a detector element is fastened to the guide means for distinguishing the field of the permanent magnet without interference from elements of the field of the permanent magnet having a low spatial order. Both the permanent magnet and its detection may be of an inexpensive construction. If the detection direction of the permanent magnet field is suitably chosen in relation to the local stray field of the electromagnet of the magnetic valve, the detection will be only little affected by this stray field.

**[0005]** Preferably, the guide means allow both orientations of the locking pin substantially equally in that an inlet opening is provided with a beveled and/or rounded edge for each orientation. One and the same device can

thus be used both for left-hand and for right-hand mounting.

**[0006]** The detector element is preferably based on a Reed relay and/or a Hall effect sensor. Such elements are inexpensive and available in many sizes.

**[0007]** Preferably, the detection direction of the permanent magnet field is substantially the axial direction of the locking pin. Stray fields directed transversely to the axis of the catch are usually a minimum in locations where the main field of the electromagnet is along the axis of the catch, i.e. transverse to the locking pin axis.

**[0008]** Preferably, the detector element is located at the side of the guide means opposite to the catch. This is found to render possible a convenient assembly.

**[0009]** Preferably, the detector element is designed to be included in a series arrangement of several detector elements so as to form a logic OR function in regard of the possible absence of one or several locking pins belonging to respective electronic security devices. A collective security system may thus be readily implemented for a plurality of cabinets or the like.

**[0010]** Preferably, the guide means have a tubular part with a lateral opening for allowing the catch to approach the electromagnet. The locking pin may thus be readily mechanically blocked.

**[0011]** Preferably, the tubular part is separate and fits inside the device with different internal diameters for accommodating locking pins of different diameters. Different diameters are favorable for different applications.

**[0012]** Preferably, said locking pin is substantially rotationally symmetrical externally with respect to the guide means when the device is in the closed state. This facilitates the mounting of the locking pin because the orientation of the locking pin need not be considered during mounting on/in the front plate.

**[0013]** Preferably, the electromagnet, the catch, and the guide means are accommodated in a housing of which a side face that is parallel to the directions of movement of both the locking pin and the catch is provided with an adaptation facility for providing a variable distance between the locking pin/catch and a mounting surface by means of respective adjustment elements. This also makes mounting easier.

**[0014]** Further advantageous aspects of the invention are recited in dependent claims.

## SHORT DESCRIPTION OF THE FIGURES

**[0015]** The above and further properties, aspects, and advantages of the invention will now be explained in more detail below with reference to preferred embodiments of the invention and in particular to the accompanying Figures, in which:

Fig. 1 is a constructional drawing in various orientations a to e of the combination of the housing for the magnetic valve and the guide means;  
Fig. 2 shows the mounting side face on an enlarged

scale (Fig. 1a);

Fig. 3 similarly shows the housing with cover in side elevation/cross-section (Fig. 1b);

Fig. 4 similarly shows the housing without cover in side elevation (Fig. 1c);

Fig. 5 similarly shows the housing without cover in front elevation (Fig. 1d);

Fig. 6 similarly shows the housing without cover in plan view (Fig. 1e);

Fig. 7 diagrammatically shows the assembly of locking pin and catch; and

Fig. 8 shows an OR circuit formed by a plurality of detection means.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0016]** Fig. 1 is a constructional drawing in various orientations a to e of the combination of the housing for the magnetic valve and the guide means at approximately 2/3 of its real size. A fuller description of the detailed Figures will be given below.

**[0017]** Fig. 2 shows the mounting side face (Fig. 1a) on an enlarged scale (2.4). The housing can be fastened to a base surface (wood, metal, synthetic resin) through a number of screw holes 20. Said base surface forms part of the showcase, cabinet, etc., which constitutes a storage compartment. The locking pin is mounted on a front plate which can be moved away through rotation, translation, or the like so as to provide access to the storage compartment.

**[0018]** Fig. 3 is a side elevation/cross-section showing the housing with cover (Fig. 1b) taken on the line A-A. The magnetic valve has been left out here for simplicity's sake; it fits in a holder formed by the cover 30, base 24, and raised portion 31. The catch of the magnetic valve projects from the magnet towards the right-hand side and is retracted through electrical activation of the magnet. In the absence of this activation a spring urges the catch outwards to the right so as to block a locking pin if the latter is present. The locking pin is for this purpose provided with a circumferentially reduced portion into which the catch enters. The magnet may be a commercially available standardized component.

**[0019]** An adapter plate 22 is shown at the bottom of the base plate 24. The use of different adapter plates renders it possible to realize different constructional heights. Adaptation may take place on the screw holes 20 or by means of a specially provided collar (not shown).

**[0020]** The guide means are visible on the right-hand side in the Figure in the form of a substantially cylindrical tube 26 into which the locking pin can be accommodated with wide fit. The cylindrical shape of the tube renders it possible to insert the locking pin from any of the two ends, as desired. In addition, both inlet openings are provided with rounded or beveled edges or the like for facilitating the insertion of the locking pin. The tube is

made of synthetic resin and provided with projections that fit mating recesses in the housing and/or cover so as to be fixed thereto (not shown in detail in the Figure). A detector element 28 is designed to detect a permanent magnetic field perpendicular to the plane of drawing caused by a magnetic element which lies in the plane of symmetry of the combination 24/30 in the closed condition of the device and whose vector, defined by the poles, is perpendicular to the plane of drawing. In said plane of symmetry, the magnetic valve has no appreciable magnetic field strength of its own perpendicular to said plane. Disturbances caused by magnetic materials in the surroundings are disregarded. Outside the plane of symmetry, the magnetic valve can indeed generate a magnetic field strength in the detection direction, but by first approximation (lowest order) the relevant components cancel each other out in as far as the detector element also has a spatially symmetrical sensitivity.

**[0021]** Another solution would be to position the two detector elements on either side of the plane of symmetry. In this case, however, the partial field strengths of the electromagnet must compensate each other, which was found to be less accurate.

**[0022]** Fig. 4 is a side elevation of the housing without cover (Fig. 1c). An adapter element 23 is shown here which cooperates with abutments 25 at the lower side of the housing 24.

**[0023]** Fig. 5 is a front elevation of the housing without cover (Fig. 1d). The detector element 28 is particularly clearly visible here; it is kept in place by projections serving for this purpose. The guide tubes 20 for the fastening screws are also clearly shown.

**[0024]** Fig. 6 is a plan view of the housing without cover (Fig. 1e). This shows the screw holes 20, the detector element 28, and the seat 32 for the magnetic valve in particular. Furthermore, the guide means 26 are made substantially cylindrical and are provided with rounded and/or beveled openings so that they can receive the locking pin without obstructions. A lateral opening 34 is also provided in this cylinder through which the catch of the magnetic valve can readily approach the locking pin (not shown here). The shape of this opening is not very critical.

**[0025]** Fig. 7 diagrammatically shows an assembly of a locking pin and a catch largely corresponding to Fig. 6. The locking pin 44 can be fastened to a door, front panel, etc., of the showcase etc. to be protected by means of a threaded stud or the like. The housing 58 of the security device is fastened to the other part of the showcase, for example by means of the screws described further above, which are perpendicular to the plane of drawing and are not shown. The valve magnet comprises a symmetrical coil 54, the catch 52, and a spring arrangement 56 which urges the catch to the right, so that the locking mechanism is activated in the situation shown. All this is accommodated in the housing 58. The guide means 50 are also fastened to the housing 58, and the locking pin 44 is inserted therein. The

locking pin 44 is made of a non-magnetic material such as stainless steel and comprises a cavity that holds a permanent magnet 46 which has magnet poles at its top and bottom in the Figure, so that a field vector is substantially vertically oriented in the plane of drawing. Other components outside the plane of symmetry compensate each other to a high degree. The detector element 48 is sensitive to a field in vertical direction, i.e. the presence of the locking pin 44 is detected thereby. Any disturbances caused by the catch 52 cancel each other out again. Furthermore, the locking pin 44 has a circumferential collar, so that the locking pin can only be removed when the magnetic valve is energized. Various mechanical details discussed further above have been left out in this Figure for simplicity's sake, or have been simplified. Hatchings of cross-sections have been left out in particular.

**[0026]** The locking pin 44 has been provided with beveled edges at its end face and at the front plate side of the circumferential groove for the catch. This ensures a smooth entry into the guide means under all circumstances. If so desired, the locking pin may additionally be provided with an articulation (not shown) for facilitating entry into the guide means, in particular in the case of a front plate that hinges away. The articulation may be formed by a discrete hinge or in some other manner. Since the guide means 50 are constructed as a separate cylindrical component, the diameter thereof may be different for use with locking pins of different diameters.

**[0027]** Fig. 8 shows an OR circuit formed by a plurality of detector elements. A series arrangement of three Reed relays 64, 66, 68 is connected between two connection terminals 60, 62. If the magnetic field of the permanent magnet 46 of Fig. 7 is present, the associated Reed relay will close. It is only when all locking pins are present in their respective security devices that all show-cases etc. are closed and the situation is safe. In all other cases there is an alarm condition in principle, which may be suppressed (delayed) for a short period, if so desired. The detection of the output signal may take place by means of a discriminating circuit 70, for example in response to a voltage level.

**[0028]** The present invention was described above with reference to preferred embodiments thereof. Those skilled in the art will appreciate that numerous modifications may be applied without departing from the scope of protection of the accompanying claims. The description should therefore be regarded as illustrative rather than limitative, and no limitations are to be concluded therefrom other than those recited in the claims.

## Claims

1. An electronic security device suitable for display cases, drawers, cabinets and the like in which a front plate (40) can be moved away with respect to a storage compartment, which device comprises a

locking pin (44) that is oriented transversely to said front plate and is directed towards the storage compartment, with a magnetic valve provided with a catch (52) that can be retracted in transverse direction from a blocking opening in the locking pin by means of an electromagnet (54), with selection means for detecting the retracted or extended position of the catch, and with guide means (50) for guiding the locking pin in its reciprocal movement, **characterized in that** the locking pin (44) constructed from a non-magnetic material accommodates a permanent magnet (46), and **in that** a detector element (48) is fastened to the guide means for distinguishing the field of the permanent magnet without interference from elements of the field of the electromagnet (54) having a low spatial order.

2. A device as claimed in claim 1, **characterized in that** the guide means (26) allow both orientations of the locking pin (44) substantially equally by providing an inlet opening with a beveled and/or rounded edge for each orientation.
3. A device as claimed in claim 1, wherein the detector element (28) is based on a Reed relay and/or a Hall effect sensor.
4. A device as claimed in claim 1, wherein the detection direction is substantially the axial direction of the locking pin.
5. A device as claimed in claim 1, wherein the detector element (48) is located at the side of the guide means (50) opposite to the catch (52).
6. A device as claimed in claim 1, wherein the detector element (48) is designed to be included in a series arrangement (64, 66, 68) of several detector elements so as to form a logic OR function (70) in regard of the possible absence of one or several locking pins belonging to respective electronic security devices.
7. A device as claimed in claim 1, wherein the guide means have a tubular part (26, 50) with a lateral opening (34) for allowing the catch (52) to approach the electromagnet.
8. A device as claimed in claim 1, wherein the tubular part (26, 50) is separate and fits inside the device with different internal diameters for accommodating locking pins of different diameters.
9. A device as claimed in claim 1, wherein said locking pin (44) is substantially rotationally symmetrical externally with respect to the operational part of the device when the device is in the closed state.

10. A device as claimed in claim 1, wherein the electromagnet, the catch, and the guide means are accommodated in a housing of which a side face that is parallel to the directions of movement of both the locking pin and the catch is provided with an adaptation facility (25) for providing a variable distance between the catch and a mounting surface by means of respective adjustment elements (22, 23).

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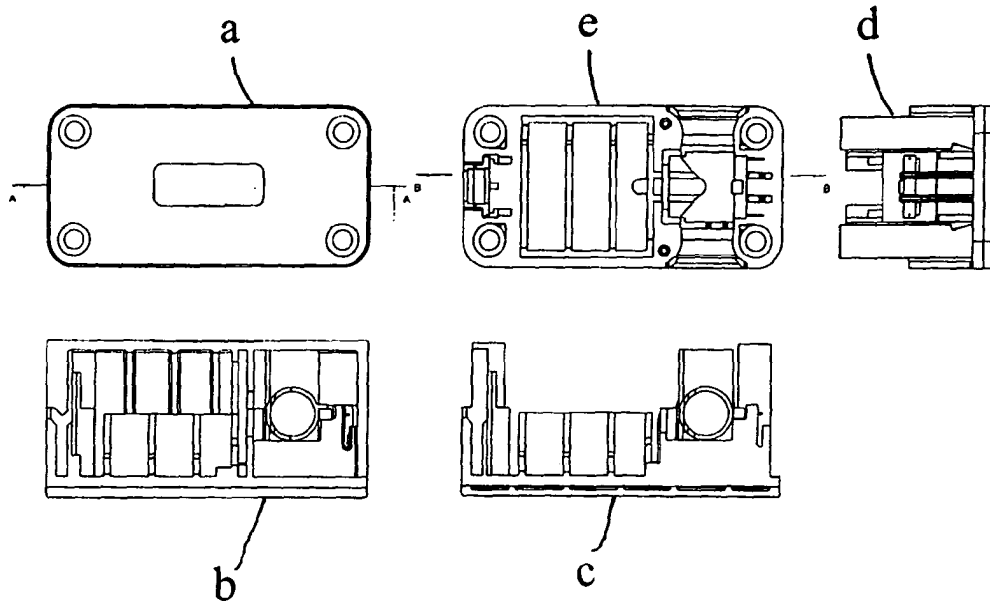


Fig. 1

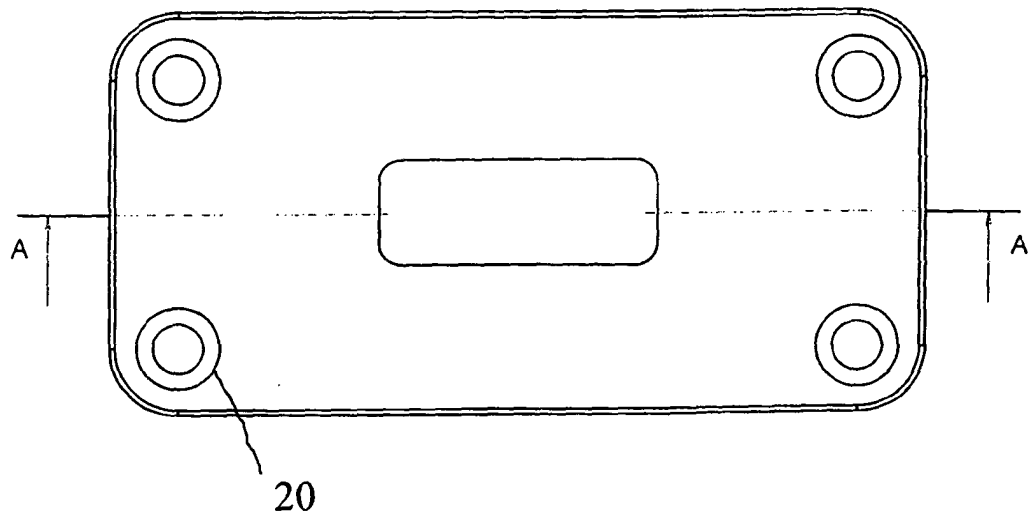


Fig. 2

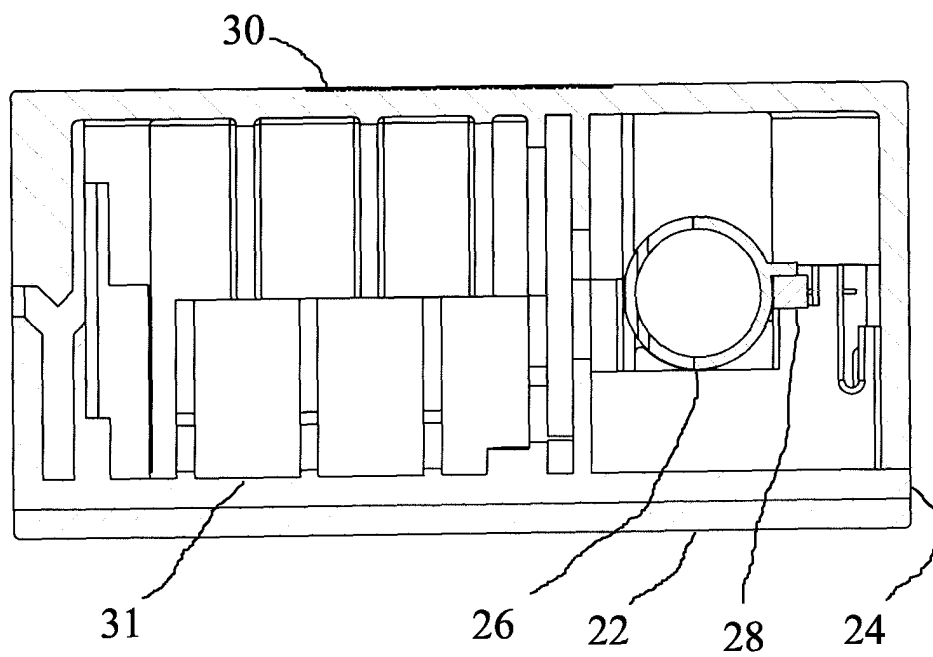


Fig. 3

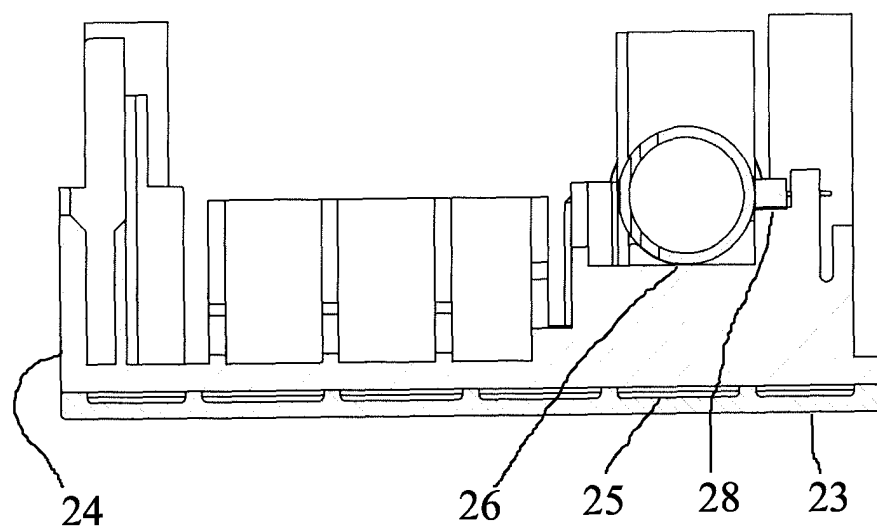


Fig. 4

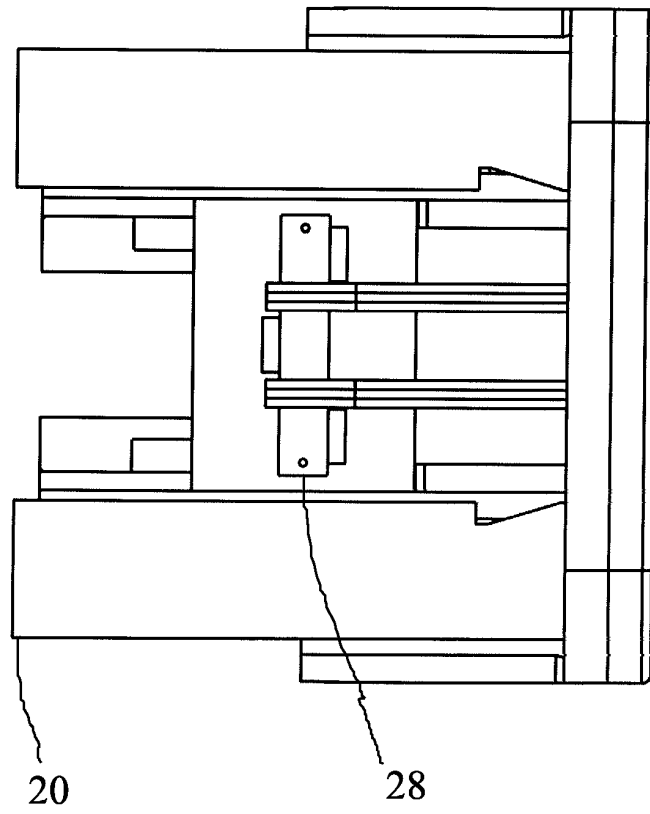


Fig. 5

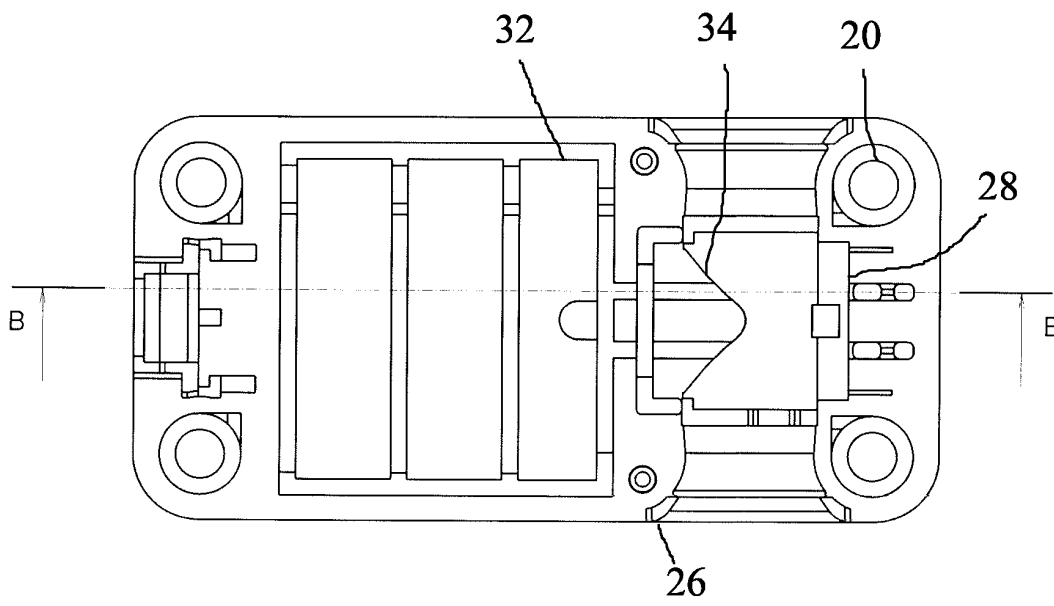


Fig. 6

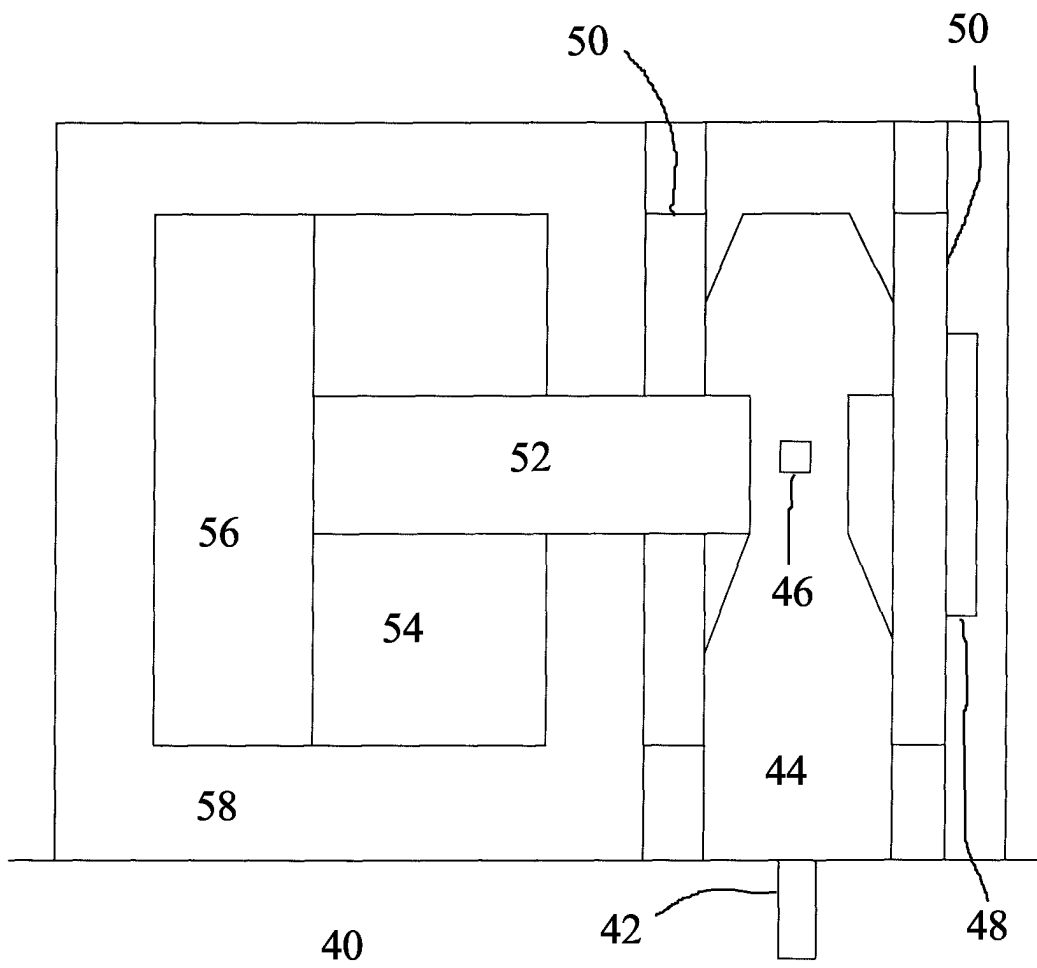


Fig. 7

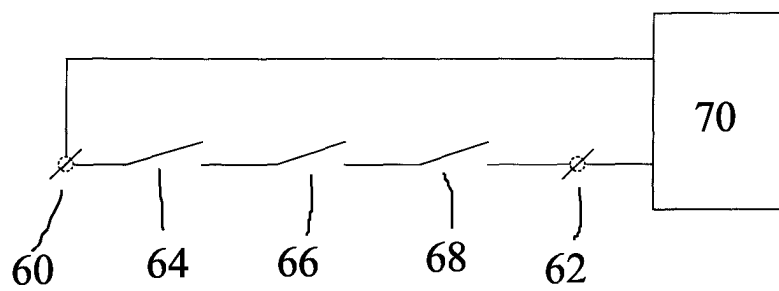


Fig. 8