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(56) Related Art
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GB 2309125
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ABSTRACT

The present invention relates to a control device (1) to be arranged to a three-
position switching device including one axis wherein the switching motion is
controlled from a common axis. The switching device is then controlled by
5 turning the control shaft in the apparatus clockwise or counter-clockwise. The
present invention provides a completely new solution that ensures a safe op-
eration of the switching device and enables to carry out checking and servic-
ing using simple means. The control device (1) of the invention comprises a
housing (5) arranged at the switching device, and a control plate (7) arranged
10 to move in the housing substantially along the surface of the apparatus re-
ceiving the switching device. Such a control plate comprises at least two crank
openings (10) to be moved at the control shaft of the switching device. The
use of the switching device can then be regulated by moving the crank open-
ings or the necks (11, 12) on both sides thereof at the control shaft, thus pre-
15 venting or allowing the manual controller controlling the switching device to be
arranged to a tuning end (13) in the control shaft.

(Figure 2)



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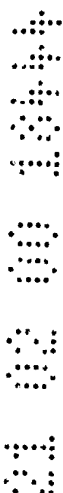
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ORIGINAL

COMPLETE SPECIFICATION
STANDARD PATENT



Invention Title:

Control device

The following statement is a full description of this invention including the best method of performing it known to us:-

FIELD OF THE INVENTION

The present invention relates to a control device according to the preamble in claim 1. Such a device is intended to be arranged to a three-position switching device in particular, used for example in cells forming high voltage apparatuses, the switching motion control of such a cell being carried out from a control shaft in one control point. The switching device is then controlled by turning the control shaft clockwise or counter-clockwise. The switching device is governed by a rotational crank or another corresponding manual control unit arranged at the outer end, or tuning end, of the control shaft.

BACKGROUND OF THE INVENTION

It is previously known to manufacture various three-position switching devices including one axis, where the switching device enables the apparatus to be switched between the open, closed and earthed positions. However, a problem with the prior art is to ensure the control in such a manner that only one switching movement takes place when the control shaft is turned, that is between closed-open, open-earthed, earthed-open or open-closed positions. For security reasons, a switching movement without the switching device distinctly stopping in the open position has to be prevented. A change from the open position to the earthed position has to require specific measures. The same requirement holds true when changing from the earthed position to the open position, and from there to the closed position.

Prior art solutions generally employ two separate simultaneously visible control points of the switching device, whereby access to one of the control points can always be prevented, for example, by blocking or closing in some other way an undesirable control attempt. Separate mechanical intermediate locking mechanisms are generally used for this purpose. An example of such a mechanism is a blocking plate that mechanically moves between the control points in accordance with the positions of the switching device. Such a blocking plate is arranged to alternately close a crank opening in the casing of the apparatus leading to the control point and to the tuning end of the control shaft therein.

Carrying out servicing, measuring and testing associated with the condition of high voltage cables connected to the cells in the apparatuses has



also proven to be complicated. It has proven to be particularly problematic to turn the switching device to the open position, when the procedures to be carried out in the high voltage space in the cell so require, while the switching device is turned to the earthed position in order to open the lid of the high voltage space. Usually the lid isolating the high voltage space is closed and locked with a separate locking means that totally prevents the opening of the lid when the switching device is turned to the closed or open position. Normally safe working conditions can be provided by replacing the lid with a separate test door when the switching device is turned to the earthed position. When used appropriately the test door prevents the switching device to be incorrectly turned to the closed position. However, such a test door is very expensive and difficult to mount, and very often an appropriate test door cannot be found when needed. It is therefore tempting to start using hazardous measures and open the lid of the high voltage space by ignoring the safety locking. In such a case there is a risk that the lid closing the high voltage space is opened when the cell is live.

BRIEF DESCRIPTION OF THE INVENTION

The present invention can avoid said problems and provide a totally new solution by arranging to a desired equipment, cell or apparatus a control device allowing to safely use and lock the switching device, and also enabling to check and service the apparatus by employing simple means.

The object of the invention is achieved in such a manner that the control device comprises the characteristic features disclosed in the claims. To be more precise the apparatus of the invention is mainly characterized by what is claimed in the characterizing part of claim 1.

The control device of the invention provides an independent modular mechanism, the preferred embodiment of which comprises a part controlling the switching control of the switching device and a locking function of a service lid closing a high voltage space of a cell in a high voltage apparatus, for example. The solution of the invention successfully integrates separate equipment into one very simple entity. The most simple control device thus comprises an entity to be arranged to the housing or covering structures with only two fixing screws. The switching control and the locking function of the lid isolating the high voltage space are connected to said entity.

According to a first preferred embodiment of the invention two dif-

ferent crank openings are provided for a three-position switching device including one axis, even though the switching device comprises only one control shaft with receiving tuning ends of a manual controller. Thus the switching functions open-closed and open-earthed, typical to the switching device of the voltage apparatus, are separated as specific switching positions. In order to move between said positions requires that a rotational crank functioning as the manual controller is removed from the tuning end of the control shaft, whereafter the control plate position has to be changed in the control device of the invention. This means that the direct switching function from the closed position to the earthed position is prevented, when the switching device is provided with the control device of the invention. Four different operating positions can, for example, be accomplished with an apparatus provided with the control device of the invention in order to enable various control or locking measures.

According to a second preferred embodiment of the invention the control device can also be used to open and close a lid in an equipment or apparatus, such as a service lid of a high voltage space of a cell in a high voltage apparatus. When the high voltage apparatus is in operation the lid is locked, thus preventing all access to the high voltage space of the cell. However, in one operating position of the control device the service lid is arranged to be opened. In order to provide such a function the switching device must be in the earthed position. Only thereafter can the control device be moved to the operating position releasing the service lid. When the service lid is released it can either be detached or opened, whereafter the control device can again be reset to the previous open-earthed operating position where the switching device can, if desired, be turned to the open position. The position in question is a testing position allowed by the control device of the invention, and the necessary testing and other checking measures to be carried out in the high voltage space can thus be performed by opening the high voltage space by utilizing the control device. The control device of the invention thus allows to shift to testing and servicing through a logical operating chain from a single selector in the control device.

Since each control function of the switching device has a specific separate operating position in the control device, the switching device is easy to lock so that the switching device cannot be controlled by the manual controller using, for example, a padlock arranged at the control device.

The invention provides significant advantages. The control device is an independent unit, all functions of which are fixedly placed into a single device. The control device is not functionally connected to the surrounding structures and can thus easily be arranged to any switching device including one axis. A control plate that has a simple structure and is very easy to manufacture and to use attends to the switching control functions of the control device.

- The control device is very easy to mount. The control device comprises simply a housing with a slot which can be arranged, for example, at a sheet metal edge on the outer casing of the receiving cell, whereafter the device is locked to the apparatus with two screws.

On account of the simple plate-like structure the control device can easily fulfil the requirements concerning the tightness class required of the apparatus, for example IEC 60298, requirements of class IP3X.

With minor structural changes the control device of the present invention can also be arranged to regulate the possibilities of opening the lids in the apparatus, such as the service lid, when testing cables, and thus ensuring a safe working environment for the service and installation personnel.

As mentioned above, the functions of the control device can be prevented by arranging locks restricting the movements of the control plate thereto. Padlocks are preferably used for this purpose. The use of a padlock enables the control device to restrict the use of various areas. The locking possibility also remains when the lid in the apparatus is opened or removed, in which case a chance to operate the switching device remains but, if desired, only in a restricted way. Additional means allow the control device to be locked into a particular position or positions using several locks. Thus during mounting the control device can be arranged with a specific lock for each mechanic, whereby the switching control function and the following switching function of a voltage apparatus cannot be carried out until the last lock has been removed. Locking also ensures that motor-driven control is not allowed. The probable motor-driven control can be closed, for example, using an electric micro switch placed in the control plate of the control device. The micro switch then recognizes the position of the control plate by identifying the position where motor-driven control can be used. The first operating position of the control device, in which the switching device can be turned between "Open" and "Closed" positions, is preferably such a position. Consequently, for exam-

ple, a closed apparatus provided with an open service lid cannot be controlled using remote-control by mistake driven by the motor therein.

Additional means allow one or more fixed locks to be arranged to the control device of the invention. Such locks can also be arranged to operate when the service lid of the apparatus is open. The fixed lock then functions as an alternative to the padlock and provides a chance for apparatus-specific keys. A key can then be removed merely in connection with the locking. When fixed locks are used they can also be arranged in series with the fixed locks of other apparatuses to offer additional locking possibilities.

10 BRIEF DESCRIPTION OF THE DRAWINGS

In the following the invention will be described in greater detail with reference to the attached drawing showing a preferred embodiment of the control device, in which

Figure 1 schematically shows how a control device of the invention is attached to a cell provided with a switching device,

Figure 2 is a front perspective view of the control device in Figure 1 seen diagonally from above,

Figure 3 is a front view of the control device in Figure 1,

Figure 4 is a top view of the control device in Figure 1, also schematically showing a slot,

Figure 5 is a side view of the control device in Figure 1,

Figure 6 shows the control functions of the control device of the invention provided with four operating positions,

Figure 7 a-e are schematic front, side and top views showing the operating positions according to the control functions of the control device in Figure 6,

Figure 8 is a cross section taken along line A-A in Figure 3 of a switching means of the control device when a service lid is closed, for example, in operating positions I, II or III,

Figure 9 is a cross section taken along line A-A in Figure 3 of a switching means of the control device when a service lid can be opened, for example, in operating positions III or IV, and

Figure 10 is a perspective view showing a preferred embodiment of the control device of the invention provided with a fixed locking.

35 DETAILED DESCRIPTION OF THE INVENTION

A preferred embodiment of the invention comprises a solution according to the attached Figures 1-5. Such a control device 1 is arranged to a cell 2 forming a high voltage apparatus of Figure 1 and particularly to an outer casing 4 of a low voltage space 3 in the cell preferably with a few self-drilling screws. Consequently it is very easy to attach the control device to an apparatus since the connection is very firm, thus ensuring a reliable function of the apparatus.

Thus the basic solution of the control device 1 of the invention comprises, for example, a housing 5 to be arranged to the low voltage space 3 of the cell 2 comprising a mounting slot 6 receiving the edge of the outer casing 4. A control plate 7 slidably arranged to a control slot 8 in the housing of the device and arranged to move in parallel with the outer casing surface forms the most important part of the control device. A preferred embodiment of the control plate comprises two adjacent crank openings 10 penetrating the plate and receiving a manual controller 9 controlling a switching device. What are known as necks 11 and 12 are formed on the control plate between the crank openings and on both sides thereof. The crank openings in the control plate can alternately be moved at a tuning end 13 in the control shaft extending to the switching device in order to arrange a rotational crank using the switching device or another equivalent manual controller 9 to the tuning end.

By moving the control plate 7 in parallel with the cell surface the crank openings therein will alternately be at the tuning end 13, in which case the manual controller is arranged to the switching device in order to carry out control motion. Then again, arranging the manual controller to the tuning end can be prevented by at least partly blocking the tuning end with the neck, i.e. the middle neck 11, between the crank openings 10 in the control plate in accordance with Figure 2. The tuning end can also be blocked with the necks, i.e. the side necks 12, on either side of the crank openings in accordance with Figure 3. The length of the rotational motion of the manual controller can be separately and differently regulated in each crank opening by providing the surface of the manual controller with a blocking means 14 or by forming the manual controller surface so that it comprises a protruding ridge and by arranging control sectors 15 receiving such a ridge to the crank openings of the control plate. The control plate of the control device 1 can thus be formed such that when the first crank opening thereof is at the tuning end of the switching device the switching device can be turned only between the switch

positions "open" and "closed". When the second crank opening is at the tuning end the control sector in the crank opening determines the movement of the manual controller as such that only positions "open" and "earthed" can be selected by the control motion of the manual controller 9.

5 The control device 1 of the invention and the control plate therein can thus easily ensure that the switching device cannot be turned directly from the "Closed" position to the "Earthed" position, which turning could damage the switching device and the apparatus connected thereto. The geometrical shapes of the crank openings 10 in the control plate also enable to partly or
10 entirely prevent the movements of the manual controller 9 controlling the switching device. Consequently the movements of the manual controller can be partly restricted by the form of the control sectors 15 in the control plate or entirely restricted by preventing the access of the manual controller to the tuning end by selecting an operating position for the control plate that blocks
15 the tuning end at least partly.

The preferred embodiment of the control device 1 of the invention comprises four operating positions. The control functions of said operating positions are schematically shown in Figures 6 and 7 a-e. In the first operating position (I) of the control device shown in Figure 7a, the switching device can
20 be turned from the closed position to the open position or from the open position to the closed position. The switch of the apparatus can then be in the closed, open or earthed position. In the second operating position (II) of the control device shown in Figure 7b, the switching device cannot be turned at all, as the middle neck 11 between the crank openings 10 blocks the tuning
25 end 13 of the control shaft, thus preventing the arrangement of the manual controller 9 to the control shaft controlling the switching device. The switching device then maintains the position selected thereto, i.e. the switch can be in the closed, open or earthed position. In the third operating position (III) of the control device shown in Figure 7c, the tuning end of the switching device is
30 again released and the switching device can thus be turned from the open position to the earthed position or from the earthed position to the open position. The switch can be in the closed, open or earthed position. In the fourth operating position (IV) of the control device shown in Figure 7d, the side neck 12 of the control plate 7 prevents the access of the manual controller to the
35 tuning end, and the switching device cannot be turned. The switch is then in the earthed position, since the blocking means 16 arranged between the con-

5 control plate and the tuning end 13 affects the movements of the control plate.
 The blocking means enables the control device to be moved into the latest
 operating position only when the switching device is turned to the earthed po-
 sition. Such a blocking means comprises, for example, a pin 17 projecting to-
 10 wards the switching device at the edge of the control plate 7 according to Fig-
 ures 9 or 10, the pin being arranged to hit the tuning end 13 of the control
 shaft of the switching device when it is turned to another position than said
 earthed position of the switching device. However, the tuning end comprises a
 cut 18 into which the pin is arranged to slide when the switching device is
 turned to said earthed position.

15 In order to control the movements of the control plate 7 a selector
 arm 19 is preferably arranged to protrude from said control plate, the selector
 arm preferably being manually operated from outside the cell. Then the se-
 lector arm is arranged to penetrate through a lid 20 closing a low voltage
 20 space, for example, through an opening 21 in the lid. In order to prevent the
 use of the operating positions in the control device or in order to lock the con-
 trol device into a desired operating position, the control plate can be locked to
 be stationary. The simplest way to implement this is in accordance with the
 present embodiment, where said selector arm 19 allows the control plate to be
 25 attached to be stationary to one or more locations in the housing 5 of the ap-
 paratus or to be attached to a mounting plate 22 in the outer casing of the ap-
 paratus or apparatus part receiving the device or to be attached to said
 mounting plate firmly fastened to the casing through known mechanical ele-
 ments therein and locks arranged thereto to be set opposite or against each
 30 other. The selector arm 19 according to the Figures is therefore provided with
 at least one locking hole 23 as the mounting plate is provided with, for exam-
 ple, four locking holes 24 in accordance with Figure 2. When the control plate
 is slid along a control slot 8 in parallel with the outer casing of the cell, the
 locking holes 23 and 24 of the selector arm and the mounting plate can alter-
 nately be arranged against each other to the operating positions, in which
 case the holes can be arranged with, for example, a padlock 25 to prevent the
 movements of the control plate.

35 If the lid 20 closing the low voltage space 3 of the cell 2 is open, for
 example due to servicing, the controls of the switch in the cell can still be
 locked by arranging a lock to the locking holes 23 and 24 placed against each
 other in the control device of the invention. The control device of the invention

fulfills the three lock requirement, according to which the switching device cannot by mistake be turned to the closed position. It is possible to restrict the use of various areas by a plurality of locks to be mounted to the device by employing accessories such as locking scissors arranged to the control device 1.

5 The control device is provided with a locking system 26 according to Figure 10 in order to enable the opening and closing of the lid 20 leading to the low voltage space 3 irrespective of the locking of the control device 1: Such a locking system comprises a locking comb 27 moving together with the control plate 7 and a locking frame 28 arranged to be stationary regarding the control plate. Such a locking frame is arranged with a desired amount of de-
10 sired locking bodies 29 arranged with key holes in the low voltage space lid to enable the locks to be used also when the lid is closed. Only the space used in the low voltage space, i.e. the width of the low voltage space, restricts the number of locks used:

15 The locking comb 27 can be a fixed part of the control plate 7 or it can be mechanically attached thereto to be stationary, for example by welding. The locking comb comprises bolt sockets 30 for receiving lock bolts 31 in the locking bodies 29 arranged to the locking frame 28. The locking frame is either arranged to be stationary in the control device housing 5 or the low voltage space 3 in such a manner that the lock bolts of the locking bodies extend to the bolt sockets when turning the key placed in the lock.

20 The locking system 26 operates as described below. When the control device 1 is in the desired operating position the locking comb 27 and the locking frame 28 are locked to be stationary in relation to each other using at least one lock in the locking frame. Since there are generally several bolt sockets 30 in the locking comb and a plurality of locks in the locking frame, the locking can, if needed, be carried out using several locks.

25 The control device 1 of the invention can in accordance with another preferred embodiment be arranged with a switching means of a service lid 33 closing a high voltage space 32 in the cell 2 preventing the opening of the service lid. Then the service lid is arranged to the outer casing of the cell in a manner known per se, either using hinges or in accordance with Figures 8 and 9 using gripping elements receiving the edge of the service lid.

30 Such a switching means comprises, for example, a bolt 36 to be directed to an edge 34 of the service lid 33 according to Figures 8 and 9 or to a

gripping means 35 arranged thereto and preventing the movements thereof. The bolt is at least partly arranged to the control slot 8 and is then arranged by the movement of the control plate 7 in the control slot to penetrate towards the edge of the service lid, thus preventing the lid to be opened or removed from the apparatus. The bolt is thus forced to lock the service lid 33 in position in the operating positions I-III of the control plate 7. When controlling the control plate, while the switching device is in the earthed position, to the operating position IV without operating functions, the bolt is released from the position locking the service lid. The service lid can then be opened or removed, thus releasing the high voltage space 32 of the cell.

The switching means according to the present embodiment shown in the Figures comprises a cylindrical bolt 36 which penetrates the housing 5 of the control device and is provided with a variable diameter and is arranged to move substantially in parallel with its longitudinal axis substantially in parallel with the front surface of the cell 2. The cross section of the bolt may also be arranged to resemble a tetragon or a polygon, whereby several flanges protrude from the bolt in the same way as the cylindrical bolt. When the bolt is in motion it penetrates the control slot 8 and the control plate 7 sliding therein. A slot 37 for receiving the bolt is arranged to the portion in the control slot of the control plate. The slot is shaped so as to gradually taper in such way that the bolt or a part thereof penetrates the control plate in each operating position. The bolt and the slot are arranged to co-operate in such a manner that in the operating positions I-III of the control device the bolt extends to the service lid 33 or to the gripping means 35 arranged thereto, thus preventing the bolt from being removed from the position closing the high voltage space of the cell.

Then the bolt 36 of the switching device and the slot 37 in the control plate operate as described below with reference to Figures 4, 8 and 9. The cross section of the bolt comprises six portions. At the upper end on the side of the control plate 7 the bolt comprises a support part 38, small in diameter, which is arranged to move in a support hole 39 extending from the control slot 8 in the housing 5. The support part is preferably arranged with a spring element 40 in order to provide motion in parallel with the longitudinal axis of the bolt. The slot 37 in the control plate is also arranged to receive the support part in all the operating positions of the control plate. Next to the support part 38 is a locking portion 41 which is the largest part in diameter in the bolt.

When the support part moves in the slot the locking portion is arranged to move along a lower surface 42 of the portion in the control slot of the control plate 7 to the operating position IV of the control device 1. In this operating position the slot expands sufficiently to enable the vertical motion of the bolt, when the bolt moves upwards forced by the spring element 40 until it hits the housing 5. Said vertical motion of the bolt in the operating position IV is arranged to release the service lid 33, which can then be opened or removed from the cell in order to carry out servicing, for example.

As the bolt 36 moves vertically upwards and stops against the housing 5, the locking portion of the bolt is next followed at the slot 37 by a testing portion 43 of the bolt, which is smaller in diameter than the locking portion but larger in diameter than the support part. The function of the testing portion is to enable to move the control plate 7 merely between the operating position IV and III. For this purpose a part receiving the testing portion, which is somewhat wider than the support part, is arranged in the slot of the control plate between the narrowest support part 38 of the bolt and the parts receiving the widest locking portion 41, for example in accordance with Figure 4. As the testing portion of the bolt moves in the wider portion of the slot, the control plate can be moved between the operating positions III and IV, whereby the apparatus can, if needed, be switched to the open position in the operating position III, for example, in order to carry out necessary tests.

The testing portion 43 is preferably followed by a control part 44 and attachment parts 45 and 46 arranged to the service lid or the gripping means thereof. The control part is then arranged to support the bolt when it moves controlled by the spring means to the position opening the service lid or when closing the service lid towards the locking position. For this purpose, the part between the control slot and the service lid in the housing 5 is preferably provided with control holes in order to receive the control part. In the embodiment according to the Figures the attachment parts comprise a pin with flanges arranged to grip the forked opening of the gripping means protruding from the edge 34 of the service lid and to lift the service lid into the open position while the bolt moves upwards and prevents the service lid from detaching when the bolt is in the lower position in the operating positions I-III.

However, the service lid 33 of the high voltage space 32 cannot be reset in position in the operating position III of the control device, while the slot 37 of the control plate prevents the vertical motion of the bolt 36 of the

switching device. In order to attach the service lid the apparatus must at first be turned to the earthed position to release the motion of the control plate 7, whereafter the control plate can be reset to the operating position IV where the bolt is released to carry out vertical motion and can again be turned to the position closing the service lid 33, simultaneously enabling the control plate to be moved into all operating positions.

It is to be understood that the above description and the Figures related thereto are only intended to illustrate the present invention. The invention is thus not merely restricted to the above or to the embodiment determined in the claims but it is obvious for those skilled in the art that the invention can be varied and modified in a number of ways within the scope of the inventive idea determined in the appended claims.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A control device to be attached to a three-position switching device including one axis, **characterized** in that the control device comprises a housing arranged at the switching device, a control plate arranged to move in the housing, at least two crank openings in the control plate, the crank openings being arranged to receive a manual controller arranged at the end, or tuning end, of a control shaft controlling the switching device, whereby the use of the switching device is arranged to be regulated by moving the control plate in relation to the housing and the switching device, thus accomplishing the arrangement of necks in the crank openings or between the crank openings or on both sides of the crank openings at the tuning end, thus preventing or allowing to arrange the manual controller controlling the switching device to the tuning end.
2. A control device as claimed in claim 1, **characterized** in that the housing is arranged at the switching device through a mounting slot receiving an edge in the switching device or in an outer casing surrounding the control shaft arranged thereto.
3. A control device as claimed in claim 1 or 2, **characterized** in that the control plate is arranged to slide along a control slot in the housing of the control device.
4. A control device as claimed in any one of the preceding claims, **characterized** in that the crank opening comprises a control sector which is arranged to receive a blocking means in the manual controller.
5. A control device as claimed in any one of the preceding claims, **characterized** in that the control plate comprises a blocking means for restricting the motion of the control plate arranged to operate with the tuning end.
6. A control device as claimed in any one of the preceding claims, **characterized** in that the control device comprises means to arrange the control plate to be substantially stationary in relation to the switching means.
7. A control device as claimed in claim 6, **characterized** in that the means are arranged to a low voltage space receiving the control device in order to enable the opening of a lid closing said

space irrespective of the locking.

8. A control device as claimed in any one of the preceding claims, **characterized** in that the control plate is arranged to control the switching means arranged in accordance with the control plate position to affect the locking of the service lid in the apparatus as regards the apparatus.

9. A control device as claimed in claim 7, **characterized** in that the switching means comprises a bolt arranged to move regarding a part extending substantially vertically to the control slot of the control plate.

10. A control device as claimed in claim 8 or 9, **characterized** in that when the switching means is arranged to the position releasing the service lid in the apparatus and when said service lid is open, the switching means is arranged to prevent the movements of the control plate to the operating position enabling to switch between open and closed positions.

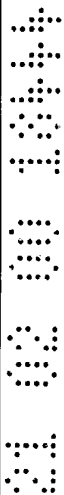
DATED THIS 18 DAY OF FEBRUARY 2000

Technology AG
ABB ~~TRANSMITT OY~~

Patent Attorneys for the

Applicant:-

F.B.RICE & CO



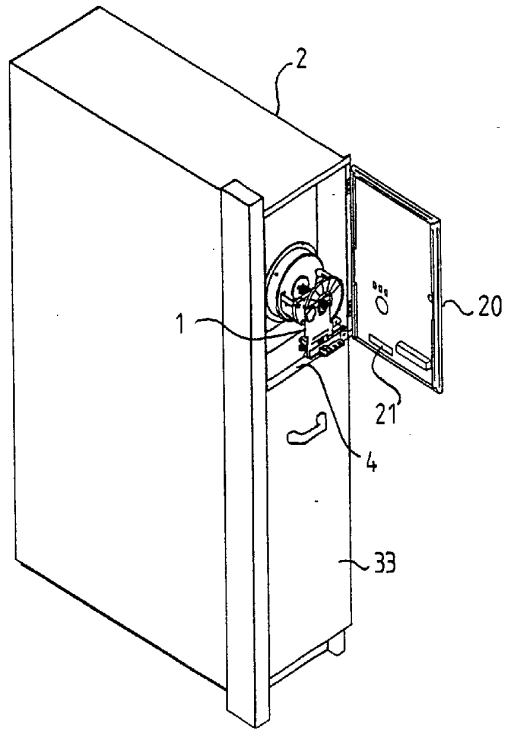


FIG. 1

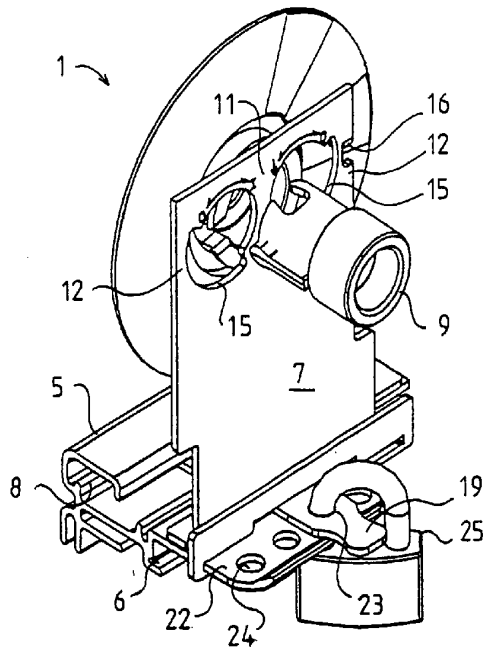


FIG. 2

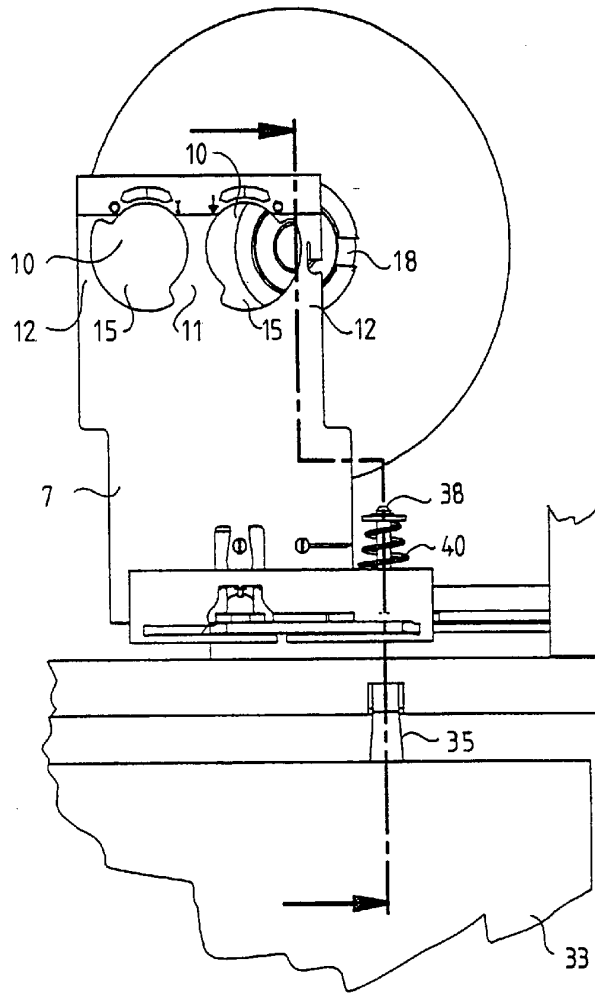


FIG. 3

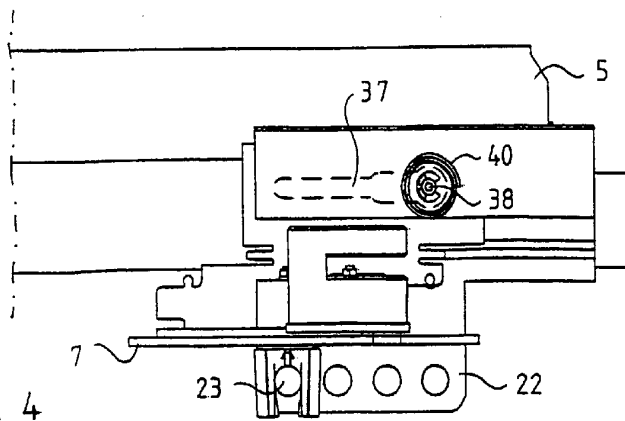


FIG. 4

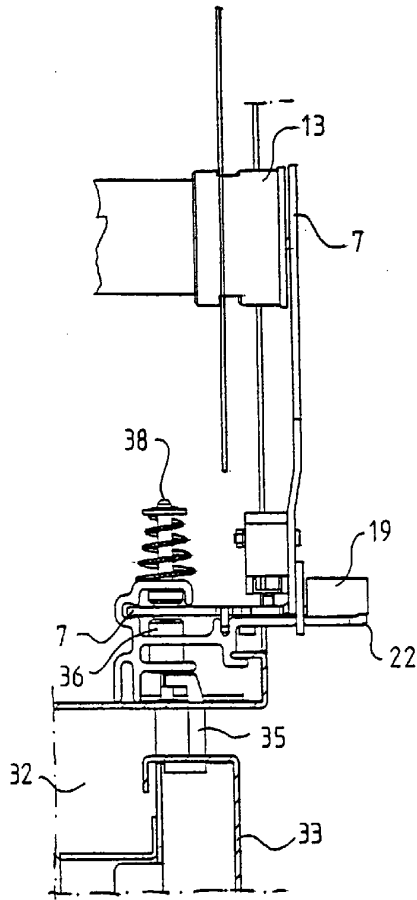


FIG. 5

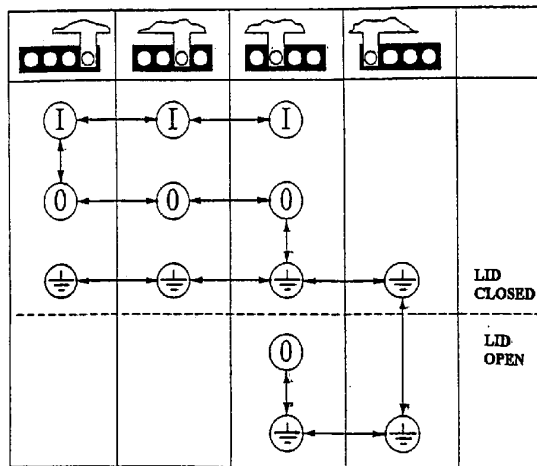


FIG. 6

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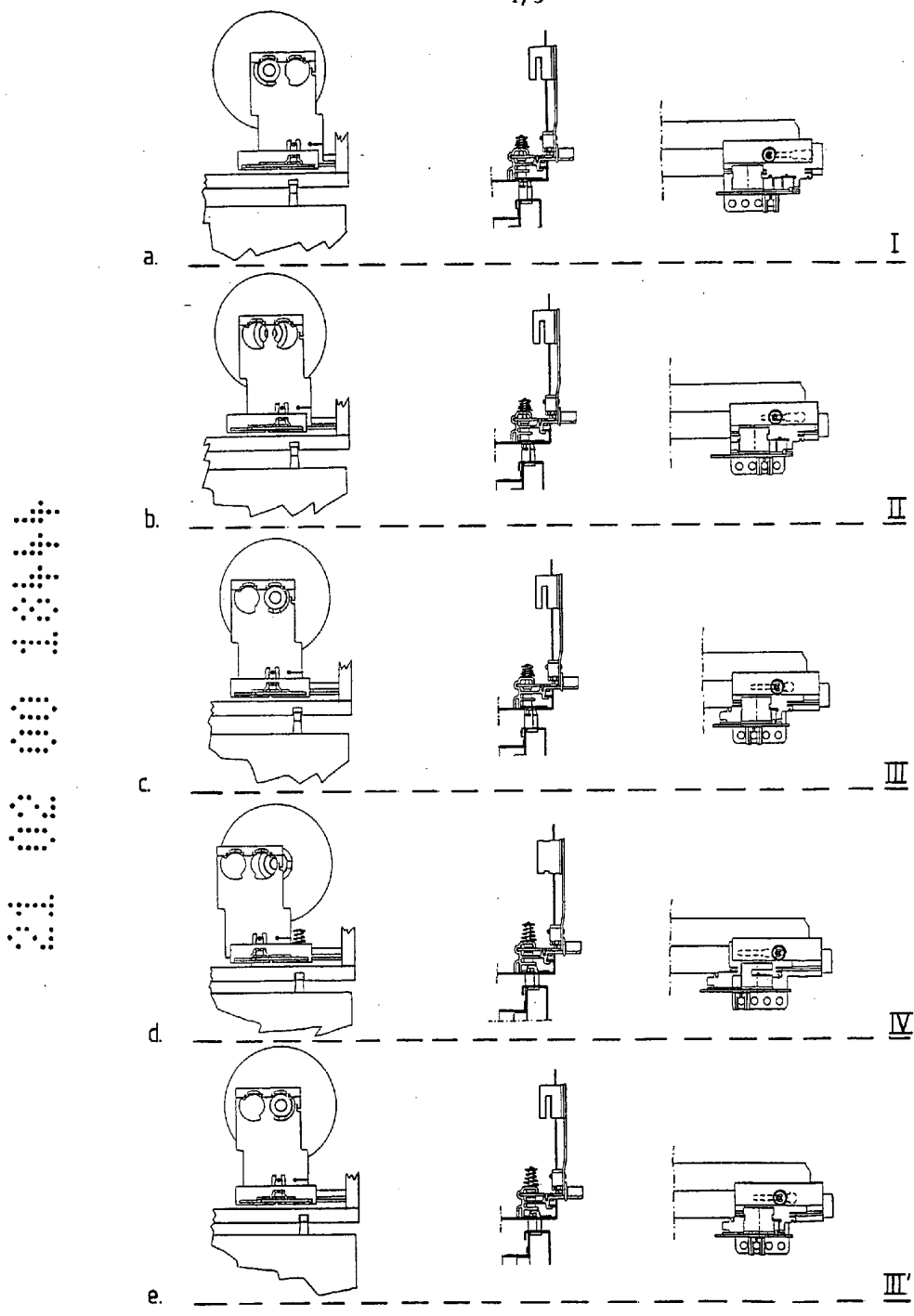


FIG. 7



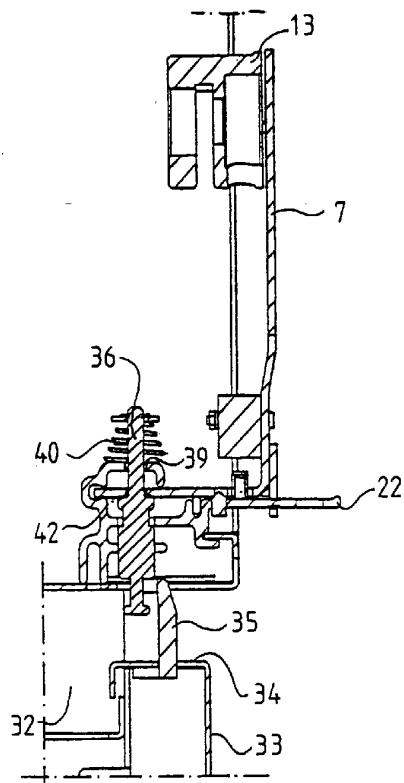


FIG. 8

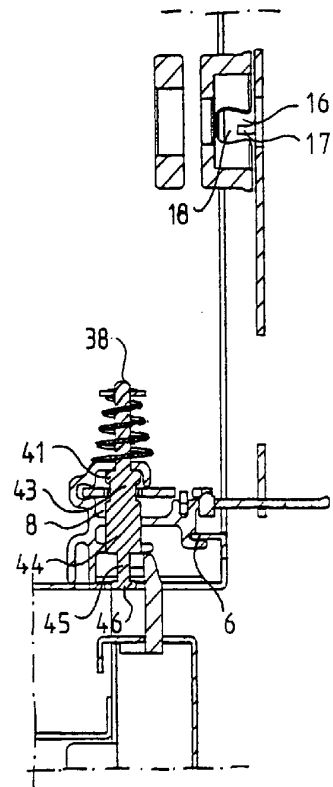


FIG. 9

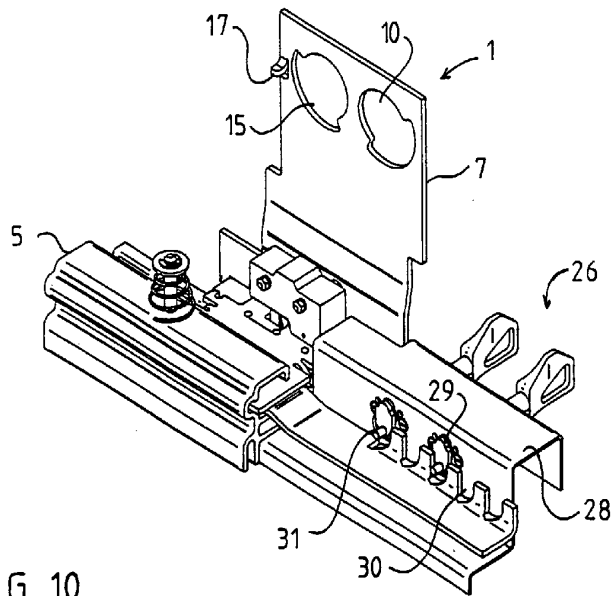


FIG. 10