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(54) ELECTROMAGNETIC OPERATING APPARATUS

ELEKTROMAGNETISCHE BETÄTIGUNGSVORRICHTUNG

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Description

Technical Field

[0001] The present application relates to the field of an electromagnetic operation device which operates, for example, a switch.

Background Art

[0002] As a switch, there is a vacuum circuit breaker which has incorporated in a vacuum container thereof a movable contact and a fixed contact, wherein opening/closing operation is carried out by causing the movable contact to move. An electromagnetic operation device which operates the switch is configured so as to enable not only electromagnetic operation but manual operation. When manually carrying out opening operation, for example, an operator causes a rotation shaft to pivot, thereby driving a lever fixed to the rotation shaft, and the lever directly pushes a movable shaft of the electromagnetic operation device, thus driving the device. Also, the rotation shaft is configured to be driven using a tool, such as a wrench (for example, refer to Japanese Patent No. 5,901,351).

[0003] Also, as a heretofore known switching apparatus, a configuration is disclosed such as to carry out opening/closing operation for three phases' worth of switch portions (switches) all at one time, wherein a handle as another part is mounted on a main shaft (a rotation shaft) when in manual operation, and a drive shaft (a movable shaft) is directly driven with a lever fixed to the main shaft (for example, refer to Japanese Patent No. 4,668,165).

Summary of Invention

Technical Problem

[0004] The electromagnetic operation device of Japanese Patent No. 5,901,351 is such that a mechanism portion for manual operation is provided paired with the electromagnetic operation device. For this reason, when a configuration is assumed in which three phases' worth of switches are included in one switching apparatus and an electromagnetic operation device is provided for each of the three phases, it is necessary to carry out manual operation per phase when carrying out manual opening operation, so that an open phase state occurs temporarily.

[0005] Also, in the configurations of Japanese Patent No. 5,901,351 and Japanese Patent No. 4,668,165, a structure is such that the movable shaft is directly driven with the lever fixed to the rotation shaft, thus requiring operation torque high enough to directly rotationally operate the rotation shaft to which the lever is fixed, and there is a problem with operability in that the operation torque increases with an increase in the number of devices to be manually operated all at one time. Also, there is also a problem with operability in that a handle for manual operation, or the like, is not equipped on the device side.

[0006] Document US 2007/253124 A1, according to its abstract, states that a circuit breaker includes a circuit breaker housing and a plurality of independent poles. Each of the independent poles includes separable contacts, a voltage sensor mounted on or within the circuit breaker housing and being structured to sense voltage operatively associated with the separable contacts, and an electro-magnetic actuator structured to open and close the separable contacts. A point-on-wave controller is housed by the circuit breaker housing and cooperates with the sensors and the actuators of the independent poles to independently and synchronously open and close the separable contacts of the independent poles.

[0007] Document JP 2010 135267 A, according to its abstract, states that a solenoid controller includes: a plunger which is fixed to the outer portion of a shaft; an inputting coil which makes the plunger move in the input direction; a tripping coil which makes the plunger move in the direction for tripping; a tripping spring which has a repulsive force in the tripping direction to the plunger; an attraction iron core which is located in the input direction of the plunger and on the outer portion of the shaft; a yoke which covers the outer surface of the inputting and tripping coils; a permanent magnet which is located between the yoke and the attraction iron core to form a magnetic flux path passing through the plunger, the yoke, and the attraction ion core at the time of inputting operation completion; and an annular magnetic material which is located between the inputting and tripping coils at a position where a magnetic flux density generated at the start of excitation for the inputting coil becomes larger than a magnetic flux density generated in the plunger.

[0008] Document US 2005/063107 A1, according to its abstract, states that an encapsulated medium voltage vacuum circuit interrupter includes a line terminal, a load terminal, a vacuum interrupter, an operating mechanism and an elongated, insulated, generally cylindrical encapsulating housing. The vacuum interrupter includes a vacuum envelope containing a fixed contact assembly and a movable contact assembly movable between a closed circuit position in electrical communication with the fixed contact assembly and an open circuit position spaced apart from the fixed contact assembly. The fixed contact assembly is electrically interconnected with the line terminal. A flexible conductor electrically connects the movable contact assembly with the load terminal. The operating mechanism moves the movable contact assembly between the closed circuit position and the open circuit position. The housing includes a first end supporting the line terminal and an opposite second end supporting the load terminal. The housing encloses the vacuum interrupter, the flexible conductor and the operating mechanism.

[0009] Document US 2013/187733 A1, according to its abstract, states an electrical switchgear which com-

bines, connected electrically in series, a visible disconnect switch (operated by a main switch actuator) and a circuit breaker module (which may also be termed an interrupter) including circuit breaker contacts which are opened and closed by an electrically-activated magnetic actuator and capable of interrupting fault currents. The magnetic actuator is stable in either a breaker-closed state or a breaker-open state without requiring electrical current flow through the magnetic actuator. An interlock is provided such that, as the main switch actuator begins to move from its switch-closed position to its switch-open position, the breaker-closed state is destabilized to open the circuit breaker contacts. An interlock is also provided such that the circuit breaker contacts cannot close while the visible disconnect switch is open.

[0010] The present application has been made to solve the problem, and an object of the present application is to provide an electromagnetic operation device which enables manual operation to be carried out for a plurality of switches all at one time and also which is superior in operability.

Solution to Problem

[0011] There is provided an electromagnetic operation device according to claim 1.

Advantageous Effects of Invention

[0012] According to the electromagnetic operation device disclosed in the present application, a configuration is such that the cam mounted on the shaft is interlocked with the link member, causing the movable shaft to move, so that design margin is higher by the amount equivalent to a larger number of parts interlocking with the shaft than in the case of a configuration in which one member for causing the movable shaft to move is directly mounted on the shaft, and it is easy to adjust the operation torque necessary for manual operation, so that it is possible to operate a plurality of movable shafts all at one time by manually operating the handle portion fixed to the shaft, and thus possible to improve operability.

Brief Description of Drawings

[0013]

[Fig. 1] Fig. 1 is a partial sectional side view showing the outline of an electromagnetic operation device according to a first exemplary embodiment not forming part of the invention.

[Fig. 2] Fig. 2 is an enlarged side sectional view of the electromagnetic operation device.

[Fig. 3] Fig. 3 is a front view of the electromagnetic operation device according to the illustrative first embodiment.

[Fig. 4] Fig. 4 is a main portion enlarged plan view of a link member.

[Fig. 5] Fig. 5 is a perspective view of the electromagnetic operation device according to the first illustrative embodiment.

[Fig. 6] Fig. 6 is a side view showing a cam and the link member.

[Fig. 7] Fig. 7 is a front view of an electromagnetic operation device according to a second embodiment showing the present invention.

[Fig. 8] Fig. 8 is a side sectional view taken along the line B-B of Fig. 7.

Description of Embodiments

[0014] First exemplary embodiment not forming part of the invention.

[0015] A description will be given, using Figs. 1 to 6, of an electromagnetic operation device 100 according to a first illustrative embodiment of the present application.

[0016] Fig. 1 is a partial sectional side view showing the electromagnetic operation device 100 according to the first embodiment, the view showing the relation of connection thereof to a switch 200, opening/closing operation of which is performed by the electromagnetic operation device 100. Herein, the switch 200 is, for example, a vacuum circuit breaker, and a switching apparatus is configured of the electromagnetic operation device 100 and the switch 200.

[0017] The electromagnetic operation device 100 includes an electromagnetic operation device main body section 10, which electromagnetically operates the switch 200 when a power source can be used, and a manual operation section 20 used for an operator to manually operate the switch 200 in the event of an emergency, such as a power failure. In Fig. 1, the electromagnetic operation device main body section 10 is disposed in the central portion, the switch 200 is disposed on the right side, the manual operation section 20 is disposed on the left side, and a movable shaft 1 is disposed extending in the left/right direction so as to penetrate these sections. Three phases' worth of switches 200 are disposed aligned on the depth side of Fig. 1, and the face portion at the left end of Fig. 1 is the front of the electromagnetic operation device 100.

[0018] The switch 200 is configured so that a movable contact 201 and a fixed contact 202 axially abut each other in a vacuum container, and opening/closing of the switch 200 is controlled by the movable shaft 1 connected to the movable contact 201 being operated by the electromagnetic operation device main body section 10 or the manual operation section 20. In Fig. 1, components, such as an insulating portion positioned between the movable contact 201 and the electromagnetic operation

device main body section 10 and a conductive portion connected to the two contacts, are omitted from description.

[0019] Fig. 2 is an enlarged side sectional view of the electromagnetic operation device 100, and illustrates the configuration of the electromagnetic operation device main body section 10 with which to drive the movable shaft 1 through electromagnetic operation and the detailed configuration of the manual operation section 20 with which to manually drive the movable shaft 1. Fig. 2 corresponds to a side sectional view taken along the line A-A of Fig. 3 to be described later.

[0020] The electromagnetic operation device main body section 10, being a mechanism section which carries out opening/closing operation for the switch 200 during a usual operation, includes, inside two opposed plate-like frames 11 supported by a frame support portion 11b, a moving core 12 which, being fixed to the movable shaft 1, is configured to move axially through opening/closing operation and a fixed core 13 which is fixed to the frame 11 and provided opposite the moving core 12. The moving core 12 is operated depending on the energized state of a coil 14, and when causing a transition from a closed state to an open state, the moving core 12 moves in the open direction (to the left side) shown by the arrow in Fig. 1 and separates from the fixed core 13. When the moving core 12 separates from the fixed core 13 and a gap occurs between the two cores, the movable shaft 1 is caused to move in the open direction (tripping direction) by a spring member 30 provided in the end portion (the left end portion) of the movable shaft 1 on the side opposite from the switch 200, and the movable contact 201 of the switch 200 separates from the fixed contact 202 and comes into the open state. A spring retainer plate 31 with which to retain the spring member 30 is disposed in the end portion of the moveable shaft 1.

[0021] The manual operation section 20 is a mechanism section with which to switch the switch 200 from the closed state to the open state through the operator's manual operation. As shown in Fig. 2, the manual operation section 20 is provided in one end portion of the movable shaft 1 in which the spring member 30 is disposed, that is, in the end portion on the side not connected to the switch 200. Then, the manual operation section 20 is configured mainly of a link member 3 which axially pushes a flange 2 fixed to the outer peripheral portion of the movable shaft 1, a rotation shaft 3a which pivotably supports the link member 3, a shaft support portion 4 supported on the frame 11, a shaft 5 pivotably supported in the shaft support portion 4, a cam 6 which, being fixed to the shaft 5, is in contact with the link member 3, and a handle portion 7 formed of an arm portion 8 extending radially outward from the shaft 5 and a grip portion 9 attached to the radially outward end portion of the arm portion 8.

[0022] To give a further description, the shaft 5 is disposed spanning a region in which are aligned the three phases' worth of electromagnetic operation device main body sections 10, and three cams are mounted on the one shaft 5 so as to correspond to each of the three phases' worth of electromagnetic operation device main body sections 10.

[0023] Furthermore, the link member 3, being provided between the shaft 5 and the movable shaft 1 of each of the electromagnetic operation device main body sections 10, is pivotably supported on the rotation shaft 3a supported on the frame 11, and one end portion of the link member 3 is in contact with the cam 6, while the other end is in contact with the flange 2 integrally fixed to the movable shaft 1. The link member 3, being a member which conveys the movement of the cam 6, is formed to dimensions corresponding to the distance between the shaft 5 and the movable shaft 1. The example of Fig. 2 shows the link member 3, the planar shape of which is arcuate, the end portions of which are shaped to protrude to the flange 2 and cam 6 sides, and which has a flat joint surface which comes into contact with the cam 6.

[0024] The electromagnetic operation device 100 of the present application is configured so that the shaft 5 is caused to pivot in accordance with opening operation of the handle portion 7, and the three phases' worth of movable shafts 1 are caused to move at the same time via the cams 6 and the link members 3, thus manually carrying out opening operation for three phases all at one time.

[0025] Fig. 3 is a front view of the electromagnetic operation device 100 in the closed state as observed from the front side. As shown in Fig. 3, the three phases' worth of electromagnetic operation device main body sections 10 are aligned in a line along the axial direction (the left/right direction) of the shaft 5, wherein the movable shafts 1 provided individually in each of the electromagnetic operation device main body sections 10 are disposed in parallel separated from one another, and the movable shafts 1 and the shaft 5 are disposed separated so as to ensure a constant distance for causing the link members 3 to pivot. In Fig. 3, the three movable shafts 1 extend in the depth direction, and one linear grip portion 9 of the handle portion 7 of the manual operation section 20 is held parallel to the shaft 5 below the movable shafts 1.

[0026] Then, in order to make the operator's handle operation easier, the grip portion 9 of the manual operation section 20 is provided exposed on the front side of the tabular frame 11 and is held so as to protrude to the near side of the operator when closing, thus providing a layout superior in operability.

[0027] For example, when closing the switch 200, the grip portion 9 is held in the state of protruding to the near side of the shaft 5, so that the arm portion 8 extending in the radial direction of the shaft 5 comes into the state of extending in a horizontal direction, and when the range of operation through opening operation is 90 degrees in terms of the angle of rotation of the shaft 5, at the end of the opening operation, as shown by the broken line in Fig. 1, the grip portion 9 is disposed below the shaft 5,

and the arm portion 8 comes into the state of extending downward from the shaft 5.

[0028] A configuration can also be adopted such that a stopper or the like (not shown) which has the function of holding the position of the handle portion 7 is provided, preventing the handle portion 7 from moving downward under its own weight.

[0029] Also, the handle portion 7 is adjusted to a weight such as to enable the handle portion 7 to be prevented from pivoting under its own weight. Then, when in the closed state, the movable shaft 1 is pushed to the switch 200 side by the electromagnetic device main body section 10, so that the handle portion 7 is configured not to pivot downward spontaneously.

[0030] Also, as shown in Fig. 3, the rotation shaft 3a for pivotably holding the link member 3 is spanned between two frame base portions 11a, which are fixed to the surface portion of the frame 11, across the movable shaft 1. The direction in which the rotation shaft 3a extends is perpendicular to the direction in which the axis of the movable shaft 1 extends, and the distance between the rotation shaft 3a and the movable shaft 1 is adjusted depending on the dimensions of the link member 3.

[0031] Fig. 4 is a main portion enlarged plan view of the link member 3 and illustrates the planar shape of link leading end portions 3b of the link member 3 which are portions in engagement with the movable shaft 1. The example of Fig. 4 shows the state in which the two link leading end portions 3b are disposed in parallel, across the movable shaft 1, in the end portion of the link member 3 on the side which drives the movable shaft 1. A configuration is such that the end portions of the link leading end portions 3b come into contact with the switch 200 side end face of the flange 2 fixed to the movable shaft 1, pivot with the rotation shaft 3a as its fulcrum in accordance with opening operation, and push the end face of the flange 2 to the side opposite from the switch 200.

[0032] Fig. 5 is a perspective view of the electromagnetic operation device 100 when closing as observed from the front side, wherein the grip portion 9 of the handle portion 7 is disposed exposed on the near side, and the arm portions 8 are each provided so as to connect the respective adjacent ends of the shaft 5 and grip portion 9. The handle portion 7 is equipped so as to be integrated with the electromagnetic operation device 100, so that there is no need to attach a handle as another member before manual operation, and it is possible to work on the manual operation immediately in the event of an emergency.

[0033] Also, a square frame body is configured wherein each pair of respective adjacent end portions of the shaft 5 and grip portion 9 is connected by the arm portion 8, so that it is possible to make the status of rotation of the shaft 5 more stable than when a drive force is applied only to one end of the shaft 5. Furthermore, the grip portion 9 is provided in conformity to the width of the three phases' worth of devices which the shaft 5 spans, so that it is possible to ensure a length long enough for an operator to grip the grip portion 9 naturally with both hands when in closing operation. Then, a configuration is such that when opening operation starts, the operator grips the grip portion 9, applies a force downward, and starts to cause the grip portion 9 to pivot, so that it is possible for the operator to operate while placing his/her weight, and it is easy to ensure operation torque required for the manual operation for three phases all at one time.

[0034] In this way, the electromagnetic operation device 100 of the present application has a better operability than heretofore in carrying out the manual operation with the manual operation section 20.

[0035] Next, a description will be given, using Fig. 6, of the operation of the cam 6 and the link member 3 when in opening operation. Fig. 6 is an enlarged side view showing the state in which the cam 6 and the link member 3 interlock with each other.

[0036] In this example, the cam 6 is configured of an egg-shaped plate cam having one apex portion. The base circle of the cam 6 is disposed concentrically with the shaft 5, and an apex portion 6a protruding by a predetermined lift amount from the base circle is attached to the shaft 5 so as to point downward when closing. When the shaft 5 rotates 90 degrees counterclockwise through opening operation, the cam 6 shown by the broken line in Fig. 6 pivots to the position in which the apex portion 6a thereof points rightward, and the apex portion 6a comes into the state of protruding to the axial switch 200 side of the movable shaft 1. In accordance with this, the link member 3 pivots counterclockwise with the rotation shaft 3a as its center (fulcrum), and one end (the lower end) of the link member 3 is pushed to the axial switch 200 side (right side) by the apex portion 6a, while the other end (the upper end) of the link member 3 is pushed to the side (left side) opposite from the axial switch 200 side of the movable shaft 1, driving the movable shaft 1 in the opening direction.

[0037] The cams 6 mounted on the shaft 5 are individually provided on each of the three switches 200, so that the three cams 6 are mounted, separated from one another, on the shaft 5 so as to correspond to the movable shafts 1, and the three cams 6 are disposed in the same shape and in the same direction.

[0038] Also, the distance from the shaft 5 to the apex portion 6a (the point of load) of the cam 6 is set to be smaller than the distance from the grip portion 9 (the point of effort) of the handle portion 7 to the shaft 5 (the fulcrum), thereby enabling the cam 6 to be driven with a lower operation torque according to the principle of leverage.

[0039] Herein, the rotation shaft 3a acting as the fulcrum of the link member 3 is disposed between the movable shaft 1 and the shaft 5. The rotation shaft 3a can be provided at the midpoint on the line which connects the one end (the point of effort) of the link member 3 in contact with the cam 6 and the other end (the point of load) of the link member 3 in contact with the flange 2 of the movable shaft 1, but can also be provided in another position

deviated from the midpoint. For example, in the link member 3, the distance between the point of effort and the fulcrum (the rotation shaft 3a) is adjusted to be larger than the distance between the fulcrum and the point of load, thereby enabling the movable shaft 1 to move in the opening direction with a lower operation torque according to the principle of leverage. Conversely, the distance between the point of effort and the fulcrum is adjusted to be smaller than the distance between the fulcrum and the point of load, thereby enabling the movable shaft 1 to move a larger amount through the opening operation of the movable shaft 1 by the manual operation section 20.

[0040] In this way, the link member 3 is a component part high in the design margin which enables the shape and disposition thereof to be decided according to conditions, such as the scale and inner structure of the electromagnetic operation device 100 and the shapes of the handle portion 7 and the cam 6. Then, the electromagnetic operation device 100 of the present application including the cam 6 and the link member 3 mentioned above is higher in design margin than one of the configuration in which a member (a lever in the prior art) for moving the movable shaft 1 is attached directly to the shaft 5, so that it is possible to adjust the shapes of the cam 6 and the link member 3 so as to enable the manual operation for three phases all at one time within the range of operation torque which can be ensured in the event of an emergency, and thus possible to further improve operability than heretofore.

Second Embodiment according to the invention

[0041] Next, a description will be given, using Figs. 7 and 8, of an electromagnetic operation device 100 according to the present invention.

[0042] Fig. 7 is a front view of the electromagnetic operation device 100 in the open state as observed from the front side, wherein in the right end position of the shaft 5, a plunger 40 is fixed to the outer surface of the frame 11, and a plunger cam 41 is mounted on the shaft 5 so as to be in contact with the plunger 40. Fig. 8 shows a side sectional view taken along the line B-B of Fig. 7.

[0043] As shown in Fig. 8, the plunger 40, having incorporated therein a compression spring 40a, is configured so as to come into contact with the plunger cam 41, thereby compressing the compression spring 40a and at the same time applying contact pressure to the plunger cam 41. A cam of the same shape as that of the above-described cam 6 can be used as the plunger cam 41, and the direction of the plunger cam 41 is adjusted so that the contact pressure is highest at the time halfway through opening operation.

[0044] The pivoting range of the shaft 5 when in opening operation is 90 degrees in the same way as in the case of the first illustrative embodiment, and the plunger cam 41 is mounted on the shaft 5 so that when the handle portion 7 pivots counterclockwise from nine o'clock to six o'clock in clock position, the pivoting range of the apex portion 6a of the cam 6 interlocking with the handle portion 7 and shaft 5 is from six o'clock to three o'clock, and that the pivoting range of the apex portion of the plunger cam 41 is, for example, shifted 45 degrees counterclockwise as compared with that of the cam 6.

[0045] In the electromagnetic operation device 100 according to the invention, a configuration is such that in the position of the middle of the pivoting range of the shaft 5 when in opening operation, the apex portion of the plunger cam 41 comes into contact with the plunger 40 and compresses the compression spring 40a, so that in the latter half portion of the pivoting range of the shaft 5 in which the apex portion of the plunger cam 41 exceeds the plunger 40, the contact pressure of the compression spring 40a incorporated in the plunger 40 acts so as for the plunger cam 41 to assist opening operation. Accordingly, it is easy to carry out the manual opening operation for the three phases' worth of switches 200 all at one time without depending only on the operator's operational force of operating the handle portion 7.

[0046] The contact pressure of the plunger 40 is highest in the intermediate position of the pivoting range of the shaft 5, so that it is possible to inhibit the movable shaft 1 which has once come into the open state from returning to the closed state and stably hold the open state.

[0047] Furthermore, in the early half portion of the pivoting range of the shaft 5, the contact pressure of the plunger 40 increases gradually as opening operation proceeds, so that when opening operation starts, a force acts such as to restore the handle portion 7 to its previous closed state. Therefore, even though a load is mistakenly put on the handle portion 7, the plunger 40 acts so as to hold the closed state, and it is possible to prevent malfunction.

[0048] In this way, the contact pressure applied from the plunger 40 is increased and reduced in the pivoting range of the shaft 5, and thereby it is also possible, while preventing malfunction, to stably hold the open state or the closed state.

Reference Signs List

[0049] 1 movable shaft, 2 flange, 3 link member, 3a rotation shaft, 3b link leading end portion, 4 shaft support portion, 5 shaft, 6 cam, 6a apex portion, 7 handle portion, 8 arm portion, 9 grip portion, 10 electromagnetic operation device main body section, 11 frame, 11a frame base portion, 11b frame support portion, 12 moving core, 13 fixed core, 14 coil, 20 manual operation section, 30 spring member, 31 spring retainer plate, 40 plunger, 40a compression spring, 41 plunger cam, 100 electromagnetic operation device, 200 switch, 201 movable contact, 202 fixed contact

Claims

1. An electromagnetic operation device (100), comprising:

   a manual operation section (20) with which to manually carry out opening operation for a plurality of switches (200) all at one time, the device being **characterized in that**
   the manual operation section (20) includes:

   a shaft (5) which, being pivotably held on a frame (11) of an electromagnetic operation device main body section (10) which operates each of the switches (200), is disposed spanning a region in which are aligned a plurality of the electromagnetic operation device main body sections (10);
   a handle portion (7) having a grip portion (9) with which to pivotally operate the shaft (5);
   a plurality of cams (6) which are mounted on the shaft (5) so as to correspond to each of the plurality of electromagnetic operation device main body sections (10); and
   a link member (3) which, being provided between the shaft (5) and a movable shaft (1) of each of the electromagnetic operation device main body sections (10), is pivotably supported on a rotation shaft (3a) supported on the frame (11), and one end portion and the other end portion of which are in contact respectively with the cam (6) and with the movable shaft (1), wherein
   a configuration is such as to cause the shaft (5) to pivot in accordance with opening operation of the handle portion (7), causing a plurality of the movable shafts (1) to move at the same time via the cams (6) and the link members (3), **characterized in that**
   the manual operation section (20) includes a plunger (40) which, having incorporated therein a compression spring (40a), is fixed to the frame (11) and a plunger cam (41) which, interlocking with the plunger (40), is fixed to the shaft (5), wherein
   a configuration is such that in the intermediate position of a rotation range of the shaft (5) when in opening operation, the apex portion of the plunger cam (41) comes into contact with the plunger (40) and compresses the compression spring (40a) .

2. The electromagnetic operation device (100) according to claim 1, **characterized in that**
   the three phases' worth of electromagnetic operation device main body sections (10) are disposed aligned along the axial direction of the shaft (5), and the three movable shafts (1) individually provided in each of the electromagnetic operation device main body sections (10) are disposed in parallel separated from one another.

3. The electromagnetic operation device (100) according to claim 1, **characterized in that**
   the handle portion (7) is configured of the one grip portion (9) provided in parallel to the shaft (5) and of arm portions (8) which connect the shaft (5) and the grip portion (9), and the grip portion (9) is disposed in the state of being exposed on the front side of the electromagnetic operation device (100).

4. The electromagnetic operation device (100) according to claim 3, **characterized in that**
   the grip portion (9) of the handle portion (7) is configured, when closing, to be held on the near side of the shaft (5) in the front of the electromagnetic operation device (100), and when opening starts, to be pushed downward and pivot around the shaft (5).

Patentansprüche

1. Elektromagnetische Betriebsvorrichtung (100), aufweisend:

   einen manuellen Betätigungsabschnitt (20), mit dem eine Öffnungsoperation für eine Vielzahl von Schaltern (200) gleichzeitig manuell durchgeführt werden kann, wobei die Vorrichtung **dadurch gekennzeichnet ist, dass**
   der manuelle Betätigungsabschnitt (20) aufweist:

   eine Welle (5), die schwenkbar an einem Rahmen (11) eines Hauptabschnitts (10) der elektromagnetischen Betriebsvorrichtung gehalten wird, der jeden der Schalter (200) betreibt, und in einem Bereich angeordnet ist, in dem eine Vielzahl der Hauptabschnitte (10) der elektromagnetischen Betriebsvorrichtung ausgerichtet sind;
   einen Griffabschnitt (7) mit einem Griffteil (9), mit dem die Welle (5) schwenkbar betätigt wird;
   eine Vielzahl von Nocken (6), die so auf der Welle (5) montiert sind, dass sie jeweils einem der Vielzahl von Hauptabschnitten (10) der elektromagnetischen Betriebsvorrichtung entsprechen; und
   ein Verbindungselement (3), das zwischen der Welle (5) und einer beweglichen Welle (1) jedes der Hauptabschnitte (10) der elektromagnetischen Betriebsvorrichtung vorgesehen ist, schwenkbar auf einer Rotationswelle (3a) abgestützt ist, die auf dem Rahmen (11) abgestützt ist, wobei ein En-

dabschnitt und der andere Endabschnitt jeweils mit dem Nocken (6) und der beweglichen Welle (1) in Kontakt stehen, wobei eine Konfiguration vorliegt, die bewirkt, dass die Welle (5) entsprechend der Öffnungsoperation des Griffabschnitts (7) schwenkt, wodurch eine Vielzahl der beweglichen Wellen (1) gleichzeitig über die Nocken (6) und die Verbindungselemente (3) bewegt werden, **dadurch gekennzeichnet, dass**
der manuelle Betätigungsabschnitt (20) einen Kolben (40) aufweist, der eine Druckfeder (40a) aufweist und am Rahmen (11) befestigt ist, und eine Kolbennocke (41), die mit dem Kolben (40) zusammenwirkt und an der Welle (5) befestigt ist, wobei eine Konfiguration vorliegt, die bewirkt, dass in der Zwischenstellung eines Drehbereichs der Welle (5) bei der Öffnungsoperation der Scheitelpunkt der Kolbennocke (41) mit dem Kolben (40) in Kontakt kommt und die Druckfeder (40a) komprimiert.

2. Elektromagnetische Betriebsvorrichtung (100) nach Anspruch 1, **dadurch gekennzeichnet, dass**
die drei Phasen der Hauptabschnitte (10) der elektromagnetischen Betriebsvorrichtung entlang der axialen Richtung der Welle (5) ausgerichtet angeordnet sind und die drei beweglichen Wellen (1), die jeweils in jedem der Hauptabschnitte (10) der elektromagnetischen Betriebsvorrichtung vorgesehen sind, parallel zueinander angeordnet und voneinander getrennt sind.

3. Elektromagnetische Betriebsvorrichtung (100) nach Anspruch 1, **dadurch gekennzeichnet, dass**
der Griffabschnitt (7) aus dem einen Griffteil (9), das parallel zur Welle (5) vorgesehen ist, und den Armabschnitten (8) besteht, die die Welle (5) und das Griffteil (9) verbinden, und das Griffteil (9) ist in einem Zustand angeordnet, in dem es an der Vorderseite der elektromagnetischen Betriebsvorrichtung (100) freiliegt.

4. Elektromagnetische Betriebsvorrichtung (100) nach Anspruch 3, **dadurch gekennzeichnet, dass**
das Griffteil (9) des Griffabschnitts (7) beim Schließen so konfiguriert ist, dass es auf der nahen Seite der Welle (5) vor der elektromagnetischen Betriebsvorrichtung (100) gehalten wird und beim Beginn des Öffnens nach unten gedrückt wird und um die Welle (5) schwenkt.

Revendications

1. Dispositif d'actionnement électromagnétique (100) comprenant :
une section d'actionnement manuel (20) avec laquelle on peut exécuter manuellement un actionnement d'ouverture simultanée pour une pluralité de commutateurs (200), ce dispositif étant **caractérisé en ce que** :
la section d'actionnement manuel (20) comprend :

un axe (5) qui, étant maintenu de manière pivotante sur un bâti (11) d'une section de corps principale du dispositif d'actionnement électromagnétique (10) qui actionne chacun des commutateurs (200), est disposé chevauchant une région dans laquelle sont alignées une pluralité de sections de corps principales du dispositif d'actionnement électromagnétique (10) ;
une partie poignée (7) ayant une partie de préhension (9) avec laquelle actionner l'axe (5) en le faisant pivoter ;
une pluralité de cames (6) qui sont montées sur l'axe (5) afin de correspondre à chacune de la pluralité de sections de corps principales du dispositif d'actionnement électromagnétique (10) ; et
un élément de liaison (3) qui, étant prévu entre l'axe (5) et un axe mobile (1) de chacune des sections de corps principales du dispositif d'actionnement électromagnétique (10), est supporté de manière pivotante sur un axe de rotation (3a) supporté sur le bâti (11), et
dont une partie extrême et l'autre partie extrême sont en contact respectivement avec la came (6) et avec l'axe mobile (1),
une configuration étant telle qu'elle fait pivoter l'axe (5) en accord avec l'actionnement d'ouverture de la partie poignée (7), faisant bouger en même temps une pluralité des axes mobiles (1) via les cames (6) et les éléments de liaison (3), **caractérisé en ce que**
la section d'actionnement manuel (20) comprend un piston plongeur (40) qui, ayant un ressort de compression (40a) incorporé en lui, est fixé au bâti (11) et une came de piston plongeur (41) qui, s'enclenchant avec le piston plongeur (40), est fixée à l'axe (5),
une configuration étant telle que, dans la position intermédiaire d'une plage de rotation de l'axe (5) lorsqu'il actionne l'ouverture, la partie sommet de la came du piston plongeur (41) entre en contact avec le piston plongeur (40) et comprime le ressort de compression (40a).

2. Dispositif d'actionnement électromagnétique (100) selon la revendication 1, **caractérisé en ce que**
les sections de corps principales du dispositif d'ac-

tionnement électromagnétique (10) pour trois phases sont disposées le long de la direction axiale de l'axe (5), et les trois axes mobiles (1) prévus individuellement dans chacune des sections de corps principales du dispositif d'actionnement électromagnétique (10) sont disposés parallèlement l'un à l'autre.

3. Dispositif d'actionnement électromagnétique (100) selon la revendication 1, **caractérisé en ce que** la partie poignée (7) est constituée de la partie de préhension (9) prévue en parallèle à l'axe (5) et de parties bras (8) qui relient l'axe (5) et la partie de préhension (9), et la partie de préhension (9) est disposée de façon à être exposée sur le côté avant du dispositif d'actionnement électromagnétique (100).

4. Dispositif d'actionnement électromagnétique (100) selon la revendication 3, **caractérisé en ce que** la partie de préhension (9) de la partie poignée (7) est configurée de façon à, lors de la fermeture, être maintenue sur le côté proche de l'axe (5) à l'avant du dispositif d'actionnement électromagnétique (100), et, lorsque l'ouverture commence, de façon à être poussée vers le bas et à pivoter autour de l'axe (5).

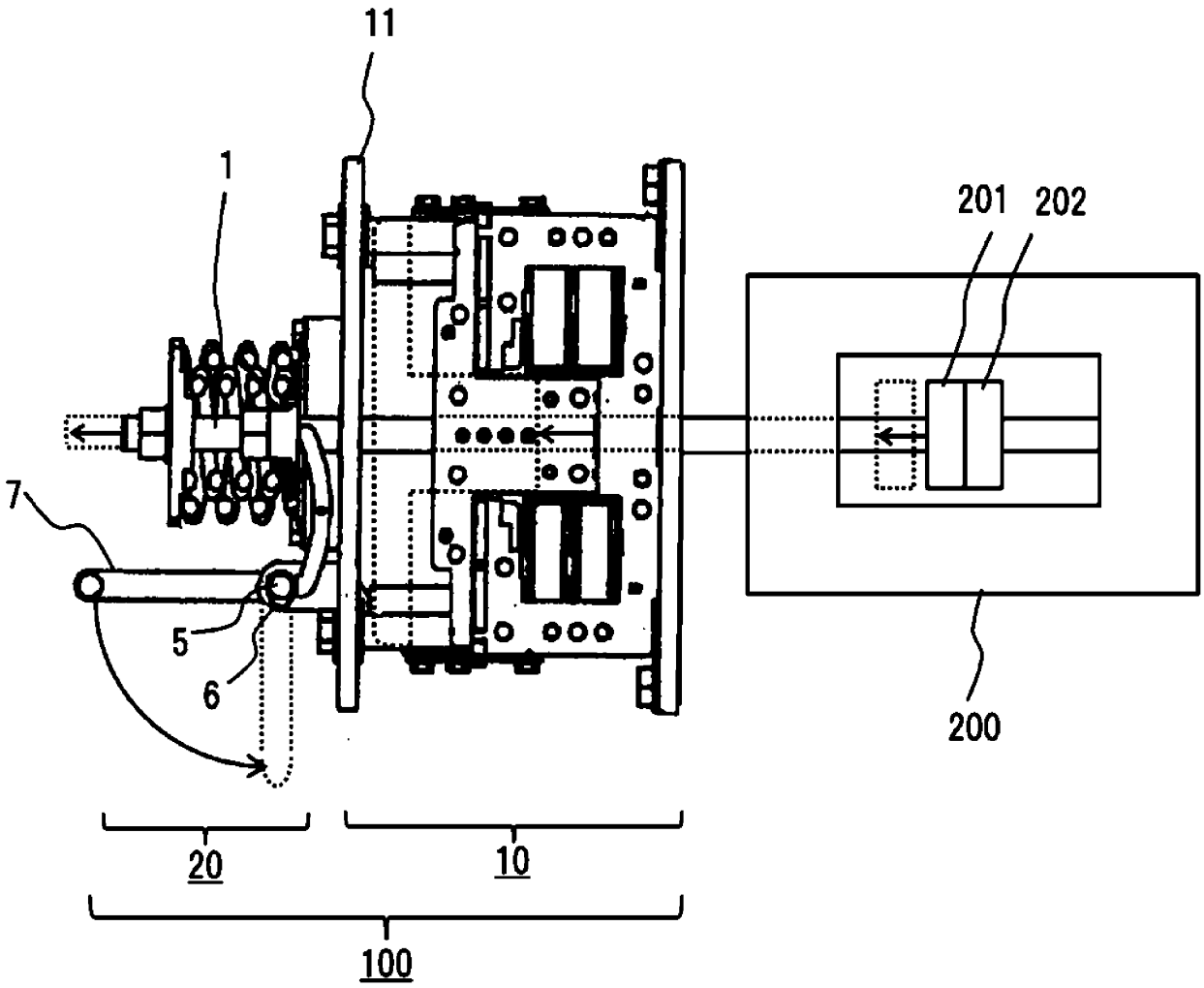

FIG.1

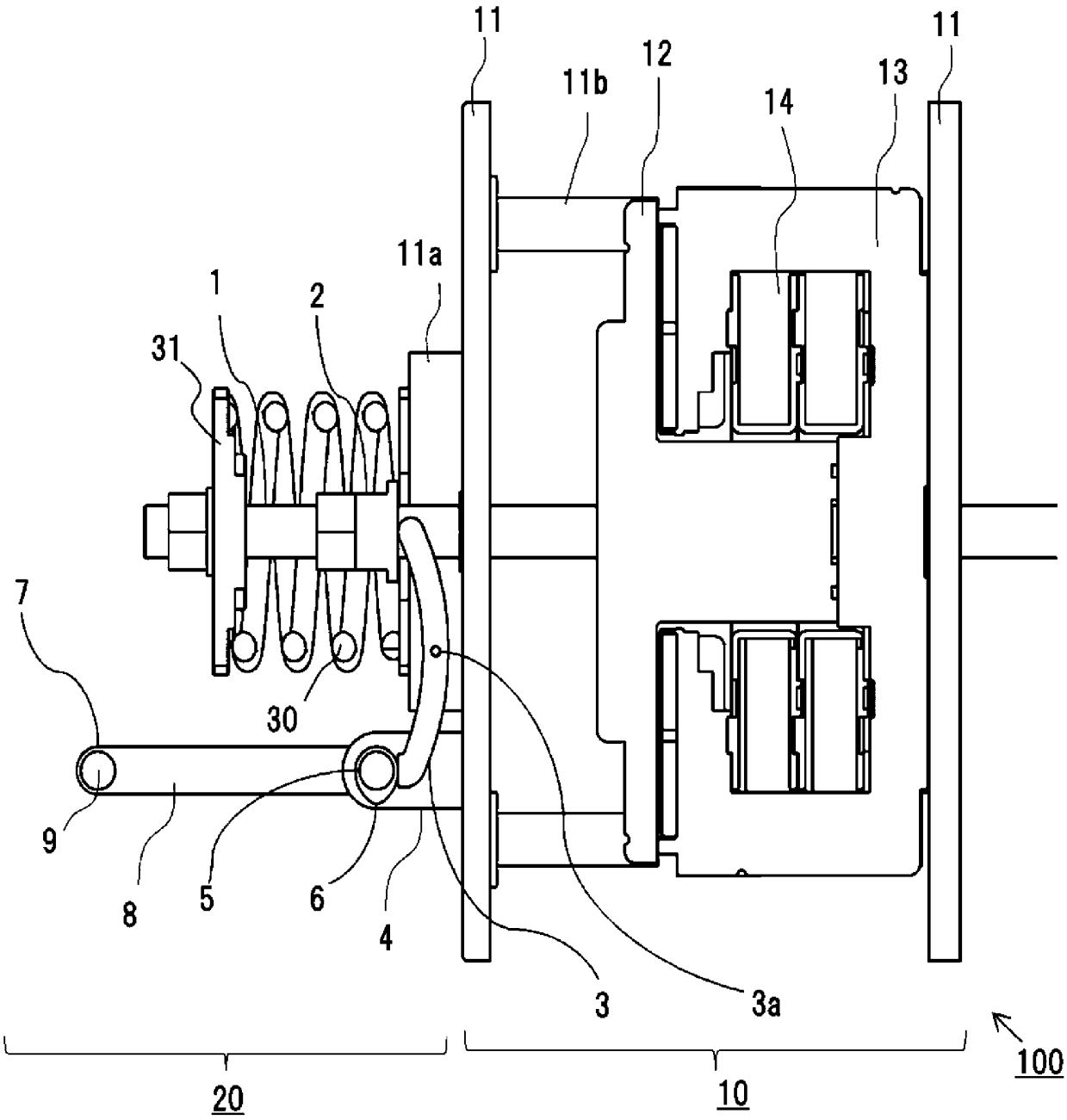

FIG.2

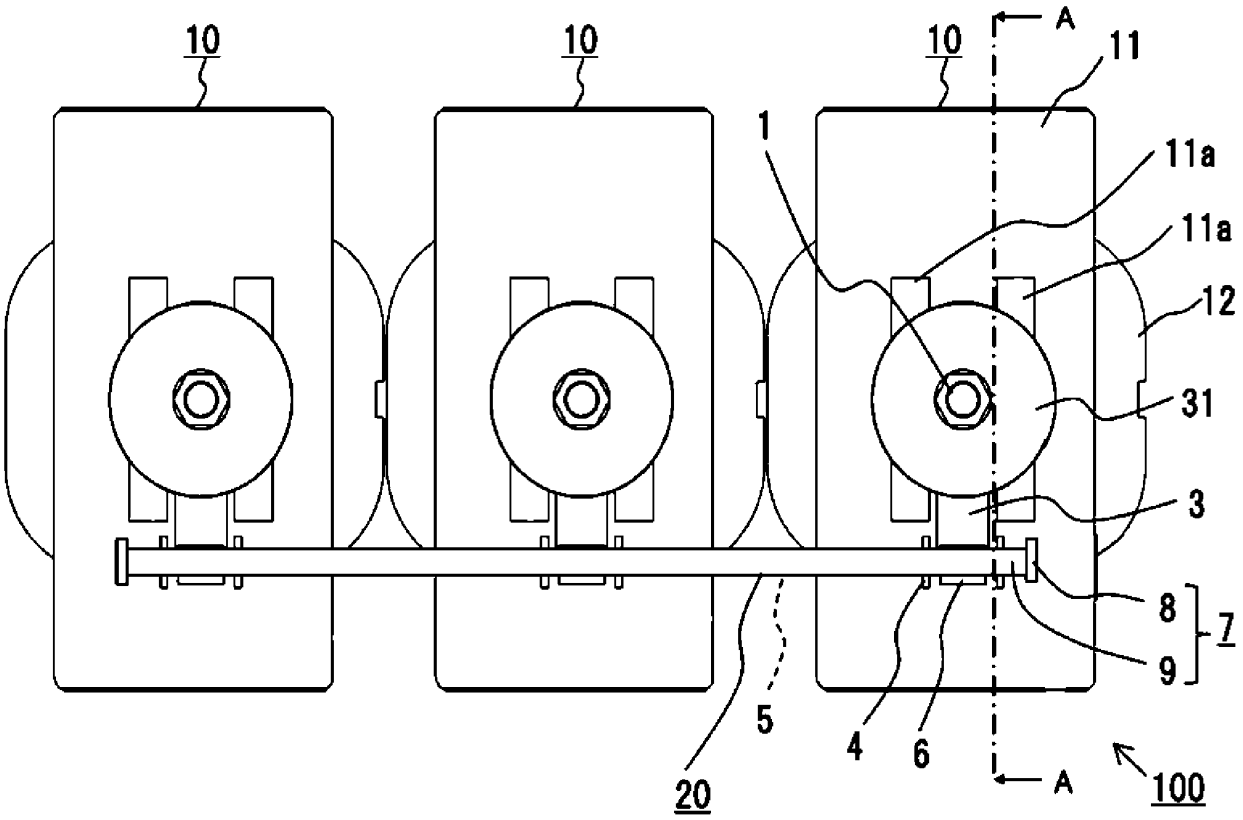

FIG.3

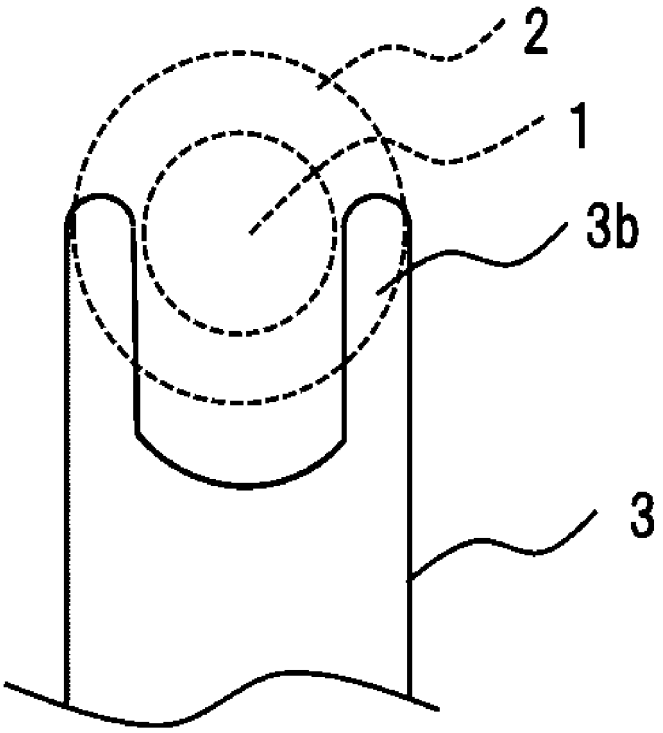

FIG.4

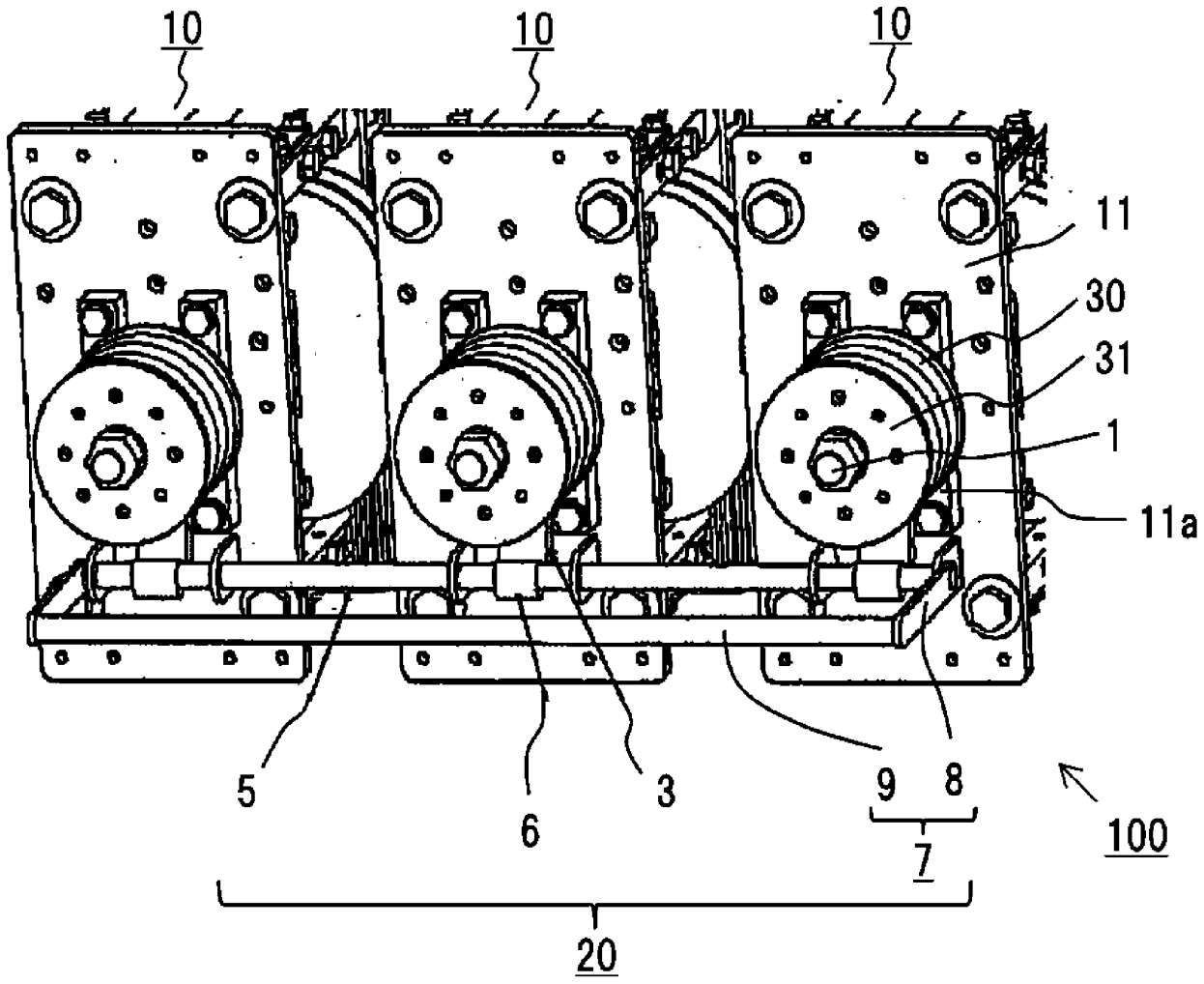

FIG.5

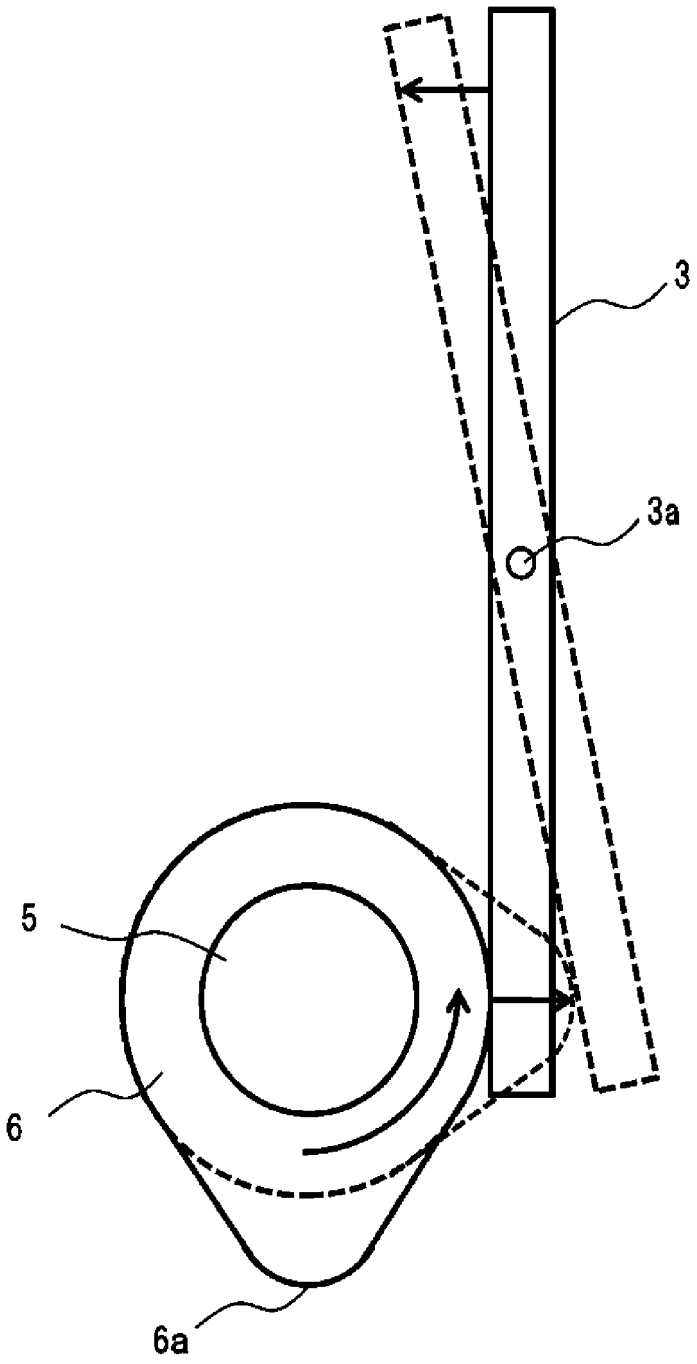

FIG.6

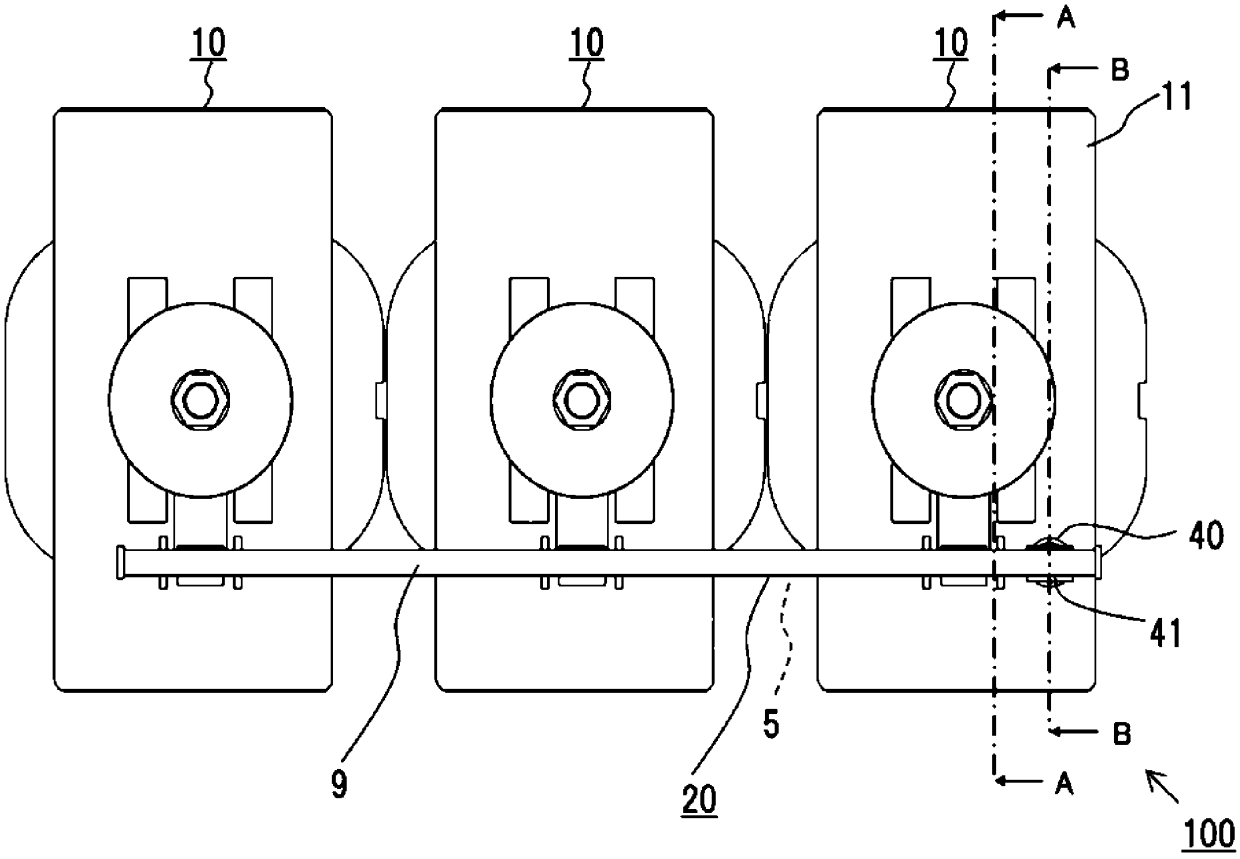

FIG.7

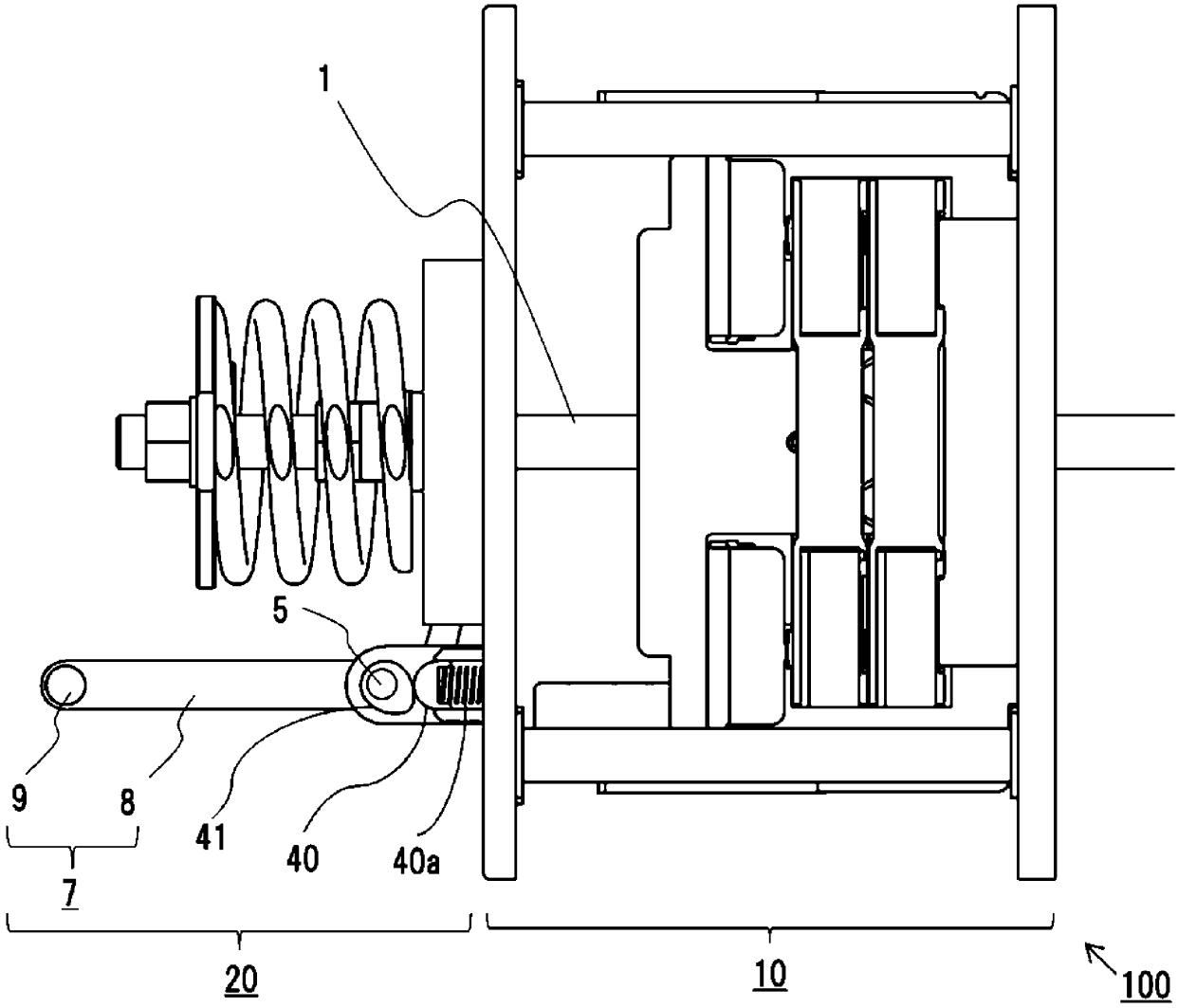

FIG.8

REFERENCES CITED IN THE DESCRIPTION

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