

## DESCRIPTION

### ELECTROMAGNETIC CONTACTOR

#### Technical Field

[0001] The present invention relates to an  
5 electromagnetic contactor arranged to supply multi-phase  
electric powers from power supply conductors, through  
fuses and switches to a load conductor.

#### Background of The Invention

[0002] In general, a switch is used in power receiving  
10 and transforming facilities for daily shutdown. The switch  
is arranged to electrically open and close the load current.  
There is a switch arranged to break a current equal to or  
greater than a daily load current, that is, an accident  
current, by fusing the fuse. This switch is referred to as an  
15 electromagnetic contactor with a fuse (hereinafter,  
abbreviated as an electromagnetic contactor). In general,  
in the conventional electromagnetic contactor, the  
longitudinal direction of the fuse disposed horizontally is  
perpendicular to the longitudinal direction of the switch.  
20 Therefore, there is a problem to increase the height.

[0003] Moreover, there is an electromagnetic contactor  
receiving board 101 shown in FIG. 9 as a conventional  
electromagnetic contactor (for example, a patent document  
1). In this electromagnetic contactor receiving board 101,  
25 a switch (load breaker, load interrupter or electromagnetic  
contactor) 103 is disposed within a case 102. The switch  
103 is connected to a disconnecting portion 105 which is on  
the input side, and which is provided to a partition wall 104.

A power supply conductor 106 is connected to the disconnecting portion 105. The power supply conductor 106 is connected to an upper power supply 107 of the switch 103. A load conductor 109 is connected to a  
5 disconnecting portion 108 which is on the output side. The load conductor 109 extends in a depth direction on a side of a back surface grounding portion 110 closing the case 102. 111 is a transformer connected to the load conductor 109. 112 is a cable head.

10 Moreover, in an electromagnetic contactor 201 shown in FIG. 10, the electromagnetic contactor 201 is connected to disconnecting portions 203 provided to a partition wall 202. A power supply conductor 204 and a load conductor 205 are connected to the disconnecting portions 203. The  
15 power supply conductor 204 and the load conductor 205 extend in a depth direction on a side of a back surface grounding portion 206 closing a case of the electromagnetic contactor (for example, a patent document 2).

Patent Document 1: Japanese Patent Application Publication  
20 No. 58-163207

Patent Document 2: Japanese Patent Application Publication  
No. 58-29307

### **Disclosure of The Invention**

#### **Problems which The Invention Is Intended to Solve**

25 [0004] In the conventional art, there is a problem to increase a size H in the height direction and a size W in the depth direction. Moreover, the mounting operation of components within the electromagnetic contactor is not easy since the length in the depth direction of the  
30 electromagnetic contactor is long.

[0005] It is an object of the present invention to provide an electromagnetic contactor with a small size by decreasing a height size and a depth size.

**Means for Solving The Problem**

5 [0006] In the first according to the present invention, an electromagnetic contactor arranged to supply multi-phase electric powers from power supply conductors which are bus bars through fuses and switches to a load conductor, the electromagnetic contactor includes: the fuses disposed  
10 within the electromagnetic contactor so as to direct longitudinal directions toward a depth side of the electromagnetic contactor; and the power supply conductors which are the bus bars, which are orthogonal to the longitudinal directions of the fuses, and each of which  
15 is disposed between the fuses, or on a longitudinal side surface of one of the fuses, the power supply conductors being electrically connected to the fuses.

[0007] In the second according to the present invention, an electromagnetic contactor arranged to supply multi-  
20 phase electric powers from power supply conductors which are bus bars through fuses and switches to a load conductor, the electromagnetic contactor includes: the fuses and the switches which are disposed on a same plane within the electromagnetic contactor so as to direct  
25 longitudinal directions toward a depth side of the electromagnetic contactor; and the power supply conductors which are the bus bars, which are orthogonal to the longitudinal directions of the fuses, and each of which is disposed between the fuses, or on a longitudinal side

surface of one of the fuses, the power supply conductors being electrically connected to the fuses.

[0008] In the third according to the present invention, an electromagnetic contactor arranged to supply multi-phase electric powers from power supply conductors which are bus bars through fuses and switches to a load conductor, the electromagnetic contactor includes: the fuses disposed within the electromagnetic contactor so as to direct longitudinal directions toward a depth side of the electromagnetic contactor; the switches which are disposed so that longitudinal directions are directions identical to the longitudinal directions of the fuses, and which are superimposed on the fuses; and the power supply conductors which are the bus bars, which are orthogonal to the longitudinal directions of the fuses, and each of which is disposed between the fuses, or on a longitudinal side surface of one of the fuses, the power supply conductors being electrically connected to the fuses.

[0009] Canceled

[0010] In the forth according to the present invention, an electromagnetic contactor arranged to supply multi-phase electric powers from power supply conductors which are bus bars through fuses and switches to a load conductor, the electromagnetic contactor includes: the fuses disposed on an intermediate supporting plate of the electromagnetic contactor so as to direct longitudinal directions toward a depth side of the electromagnetic contactor; the power supply conductors which are the bus bars, which are orthogonal to the longitudinal directions of the fuses, and each of which is disposed between the fuses,

or on a longitudinal side surface of one of the fuses; the switches mounted on the intermediate supporting plate which is opposite to a surface on which the fuses are disposed so as to direct longitudinal directions toward the depth side of the electromagnetic contactor; a potential transformer and a current transformer disposed between the fuses, the switches and an electromagnetic contactor floor surface; and a primary side charging portion of the potential transformer and a charging portion of the current transformer which are electrically connected to the fuses and the switches which are disposed on an upper side of the potential transformer and the current transformer.

[0011] In the fifth according to the present invention, an electromagnetic contactor arranged to supply multi-phase electric powers from power supply conductors which are bus bars through fuses and switches to a load conductor, the electromagnetic contactor includes: the fuses disposed on an intermediate supporting plate of the electromagnetic contactor so as to direct longitudinal directions toward a depth side of the electromagnetic contactor; the power supply conductors which are the bus bars, which are orthogonal to the longitudinal directions of the fuses, and each of which is disposed between the fuses, or on a longitudinal side surface of one of the fuses; the switches mounted on the intermediate supporting plate which is opposite to the surface on which the fuses are disposed so as to direct longitudinal directions toward a depth side of the electromagnetic contactor; a potential transformer and a current transformer disposed between the fuses, the switches and an electromagnetic contactor floor surface; a

primary side charging portion of the potential transformer and a charging portion of the current transformer which are connected to the fuses and the switches that are disposed on an upper side of the potential transformer and the  
5 current transformer; a load side contact connected to the charging portion of the current transformer, and connected to a load conductor pulling-out portion; the load conductor pulling-out portion disposed between a back surface grounding portion closing a depth of the electromagnetic  
10 contactor, and the fuses and the current transformer which confront the electromagnetic contactor floor surface.

#### **Benefits of The Invention**

[0012] By the electromagnetic contactor according to the present invention, it is possible to decrease the depth size  
15 of the combination of the electromagnetic contactor and the power supply conductor by an amount that the electromagnetic contactor is disposed to confront the longitudinal side surface of one of the fuses for one phase which is disposed within the electromagnetic contactor to  
20 direct the longitudinal direction toward the depth side of the electromagnetic contactor so as to be orthogonal to the longitudinal side surface of one of the fuses for one phase. Therefore, it is possible to decrease the depth of the case of the electromagnetic contactor, and to facilitate the  
25 mounting operation in the depth direction.

Moreover, in the present invention, it is possible to decrease the height size of the electromagnetic contactor by an amount that the longitudinal directions of the switches are disposed in the directions identical to the  
30 longitudinal directions of the fuses, relative to a case in

which the longitudinal directions of the switches are disposed in the height directions.

Consequently, it became possible to decrease the depth size of the combination of the electromagnetic contactor and the power supply conductor, and thereby to thin the  
5 depth size of the case. Moreover, it is possible to decrease the height size of the electromagnetic contactor, to decrease the case of the multistage stacked electromagnetic contactor that the electromagnetic  
10 contactors are stacked, and to stack more the electromagnetic contactors when the cases have an identical height.

### **Best Mode for Carrying out The Invention**

[0013] (First Embodiment)

15 Embodiments according to the present invention are illustrated by using FIGS. 1A, B and C, and FIG. 2 to FIG. 6.

[0014] FIGS. 1A, B, C are longitudinal sectional views showing an electromagnetic contactor according to embodiments of the present invention. FIG. 2 is a  
20 sectional view taken along a section line A-A of FIG. 1A. FIG. 3 is a sectional view taken along a section line B-B of FIG. 1A. FIG. 6 is a sectional view taken along a section line C-C of FIG. 1A. FIG. 1, FIG. 2 and FIG. 3 show a state to be electrically connected.

25 [0015] As shown in FIG. 1 to FIG. 3 and FIG. 6, the electromagnetic contactor 1 supplies multi-phase electric powers from power supply conductors 2 through fuses 3 and switches 4 to load conductor pulling-out portions 5.

[0016] The electromagnetic contactor 1 is received within  
30 a case 6. The case 6 includes an insertion opening 7

located at one end, and a portion which is on the other side opposite to the insertion opening 7, and which is a depth side. The portion of the case 6 is closed by a back surface grounding portion 8, so that the case 6 is formed into a box shape.

[0017] The electromagnetic contactor 1 includes an electromagnetic contactor floor surface 9. The electromagnetic contactor floor surface 9 is provided with wheels 10. The electromagnetic contactor 1 is arranged to move with wheels 10 between the insertion opening 7 and the back surface grounding portion 8.

[0018] The electromagnetic contactor 1 is provided with an intermediate supporting plate 11 located between the fuses 3 and the switches 4, and made from an insulating member.

[0019] For example, as shown in FIG. 2, the intermediate supporting plate 11 is supported on the electromagnetic contactor floor surface 9 by a plurality of supporting columns 12. Moreover, the supporting columns 12 are fixed to the electromagnetic contactor floor surface 9 by screws 13. Partition plates 14 are fixed to the intermediate supporting plate 11. Moreover, sandwiching clamps 15A, 15B to sandwich the fuses 3 are fixed to the insertion opening side and the back surface grounding portion side of the intermediate supporting plate 11 confronting each of the partition plates 14.

[0020] Three fuses 3 for three phases are arranged horizontally in parallel with each other to direct longitudinal directions toward the back surface grounding portion 8. Each of the fuses 3 is partitioned by the partition plates 14.

Three fuses 3 for the three phases have an identical structure. Therefore, one fuse 3 for one phase is illustrated.

[0021] The fuse 3 includes a cylindrical body portion  
5 (hereinafter, referred to as a cylindrical portion) 16, and a power supply side terminal 17 and a load side terminal 18 which are located at both ends of the cylindrical portion 16. These terminals 17, 18 are inserted into the sandwiching clamps 15A, 15B. The sandwiching clamps 15A, 15B are  
10 tightened by tightening members 19 (cf. FIG. 6) of nuts and bolts, so that the fuses 3 are fixed.

[0022] The power supply conductor 2 is disposed in the vertical direction to be orthogonal to a longitudinal side surface of the fuse 3. The power supply side terminal 17  
15 and the power supply conductor 2 are connected in the following manner. As shown in FIG. 2, a relay conductor 21 is connected to a lower end side of the power supply side terminal 17. The relay conductor 21 protrudes from the lower side (cf. FIG. 6) of the cylindrical portion 16  
20 through a middle portion of the cylindrical portion (between the power supply side terminal 17 and the load side terminal 18) to the power supply conductor 2's side to be orthogonal to the cylindrical portion 16. A power supply contact 22 is fixed to this protruding end of the relay  
25 conductor 21.

[0023] In the power supply contact 22, the number of the contact pieces is increased or decreased in accordance with current-carrying capacity so as to adjust the current-carrying capacity appropriately. The power supply contact

22 is fixed to the relay conductor 21 and the intermediate supporting plate 11 by a screw 20.

[0024] As shown in FIG. 1A, electrical connection or electrical disconnection are achieved by contacting or  
5 separating the power supply contact 22 to or from the power supply conductors 2 by moving the electromagnetic contactor 1 with wheels 10 by operating an operation portion 23.

[0025] The electric power from the power supply  
10 conductor 2 flows through the electric power supply contact 22 and the relay conductor 21, flows in a fuse line (not shown) within the cylindrical portion 16 from the electric power supply side terminal 17, and reaches the load side terminal 18. As shown in FIG. 1C, the load side terminal  
15 18 is connected through a contact 24 to a movable side conductor 25 of the switch 4. In this embodiment, the switch 4 is a vacuum valve. In the contact 24, the number of the contact pieces is increased or decreased in accordance with the current-carrying capacity so as to  
20 adjust the current-carrying capacity appropriately, like the power supply contact 22.

[0026] As mentioned above, the switch 4 is disposed horizontally so as to direct the longitudinal direction to the back surface grounding portion 8. The switch 4 is disposed  
25 below the fuse 3. With this, it is possible to lower the height of the electromagnetic contactor 1 by an amount that the longitudinal direction of the switch 4 is disposed horizontally. Therefore, it is possible to decrease the size of the electromagnetic contactor 1 relative to a case in

which the longitudinal direction of the switch 4 is disposed vertically.

[0027] The movable side conductor 25 of the switch 4 penetrates a surface plate 28 extending in the downward direction from the intermediate supporting plate 11, through an insulator 26 and a wipe spring 27, and is connected to the operating device 23.

[0028] The electric power from the movable side conductor 25 flows through a contact point (not shown) within the switch 4 to a fix side conductor 31. As shown in FIG. 1B, the fix side conductor 31 is fixed to an insulating supporting portion 32 extending in the downward direction from the intermediate supporting plate 11, by tightening means 33 such as a bolt and a nut.

[0029] The movable contact point is contacted to or separated from the fix contact point (not shown) by moving the movable side conductor by driving the operation portion 23, so that the electric power is switched between the ON state and the OFF state.

(1) In this way, in the present invention, the power supply conductor 2 is disposed so as to be orthogonal to the longitudinal side surface of the fuse 3 for each phase which is disposed in the longitudinal direction. Therefore, it became possible to decrease the depth direction of the combination of the electromagnetic contactor 1 and the power supply 2, relative to a case in which the power supply conductor 2 is disposed in the direction identical to the longitudinal direction of the fuse 3 like the conventional apparatus, and to decrease the depth size of the case.

Moreover, it became possible to facilitate the mounting

operation in the depth direction of the electromagnetic contactor 1.

(2) Moreover, in the present invention, the longitudinal direction of the switch 4 is disposed in the direction

5 identical to the longitudinal direction of the fuse 3.

Therefore, it became possible to decrease the height size of the electromagnetic contactor 1, relative to a case in which the longitudinal direction of the switch is disposed in the height direction. Moreover, in a case in which the switch 4

10 and the fuse 11 are disposed in the same plane so that the longitudinal direction of the switch 4 is disposed in the direction identical to the longitudinal direction of the fuse 3, it is possible to form a thin electromagnetic contactor 1 with a lower height.

15 By the above-mentioned (1), (2), it is possible to decrease the depth size of the combination of the electromagnetic contactor 1 and the power supply conductors 2, also to decrease the height size, and thereby to decrease the size of the electromagnetic contactor 1. Moreover, it is possible

20 to decrease a size of a case of a multistage stacked electromagnetic contactor that the electromagnetic contactors 1 are stacked on the electromagnetic contactor, or to stack more the electromagnetic contactors when the cases have an identical height. Moreover, the center of

25 gravity of the multistage stacked electromagnetic contactor becomes lower by decreasing the height size of the electromagnetic contactor. With this, it is possible to improve the earthquake protection by lowering the center of gravity, and to increase the stability at the installation.

This can be also applied to one electromagnetic contactor 1 itself.

(3) Moreover, the switch 4 is disposed below the fuse 3 so as to be superimposed. With this, it is possible to decrease  
5 the installation area of the electromagnetic contactor 1. Furthermore, the center of gravity becomes lower by decreasing the height of the electromagnetic contactor 1 relative to a case in which the switch 4 is disposed below the fuse 3 so that the longitudinal direction is disposed in  
10 the vertical direction. Therefore, it is possible to improve the earthquake protection, and to increase the stability at the installation.

(Second Embodiment)

FIG. 4 is a view showing a transformer 41 of FIG. 1A as  
15 viewed in a direction of an arrow P. FIG. 5 is a view showing a current transformer 42 of FIG. 1B as viewed in a direction of an arrow Q.

[0030] As shown in FIG. 1A, the fuses 3 and the switches 4 are mounted on an upper surface and a lower surface of  
20 the intermediate supporting plate 11 of the electromagnetic contactor 1 so that the longitudinal direction of the fuses, the longitudinal directions of the switches, and the electromagnetic contactor floor surface 9 are in parallel with each other. The transformer 41 and the current  
25 transformer 42 are disposed between the fuses 3 and the switches 4, and the electromagnetic contactor floor surface 9. The transformer 41 and the current transformer 42 are fixed to the electromagnetic contactor floor surface 9 by screws 43.

[0031] As shown in FIG. 4, in the transformer 41, two insulating cylinders 45 extend from a main body that a conductor is wound around an iron core 44, and penetrate the intermediate supporting plate 11. The two  
5 insulating cylinders 45 extend to a portion near the load side terminal 18 of the fuse 3. Two primary side leads 46A, 46B wound around the iron core 44 penetrate, respectively, the insulating cylinders 45 through protection fuses 47. As shown in FIG. 2, the primary side leads 46A,  
10 46B are connected with a first phase load side terminal 48A and a second phase load side terminal 48B. These primary side leads 46A, 46B constitute a primary side charging portion 46.

[0032] The primary side charging portion 46 is pulled out  
15 on the upper side of the transformer 41. A line voltage between the fuses 3 is measured by a load side U-terminal 49 and a load side V-terminal 50 of FIG. 1C.

[0033] As shown in FIG. 5, the current transformer 42 includes a primary side lead 52A and a secondary side  
20 leading line 52B of conductors which are wound around an iron core 51. These primary side lead 52A and secondary side lead 52B are pulled out on the switch 4's side which is the upper side of the current transformer.

[0034] As shown in FIG. 1A, the primary side lead 52A is  
25 connected to the fix side conductor 31 of the switch 4. The primary side lead 52A is disposed between the switch 4 and the insulating supporting portion 32, tightened by tightening means 33 such as a bolt and a nut, and fixed  
30 32.

[0035] The secondary side lead 52B and the load side contact 53 are fixed by tightening means 54 such as bolts and nuts.

[0036] As shown in FIG. 3, the load side contact 53 is  
5 formed into a plate shape. The load side contact 53 is disposed so that the main surfaces of the front and back surfaces become the upper and lower surfaces. This load side contact 53 is connected to the load conductor pulling-out portion 5. The load conductor pulling-out portion 5 is  
10 formed into a plate shape. The load conductor pulling-out portion 5 is disposed so that the main surfaces of the front and back surfaces become the left and right surfaces.

[0037] As shown in FIG. 6, the load conductor pulling-out portion 5 is fixed to a load conductor supporting portion  
15 57 within an insulator cover 56. In the load side contact 53, the number of the contact pieces is increased or decreased in accordance with current-carrying capacity so as to adjust the current-carrying capacity appropriately, like the power supply contact 22 and the contact 24.

[0038] As shown in FIG. 5, the primary side lead 52A, the secondary side lead 52B and the tightening means 33 are a charging portion 52, and are connected to the switch  
20 4's side which is on the upper side of the current transformer 42.

[0039] As described above, the primary side charging  
25 portion 46 of the transformer 41 and the charging portion 52 of the current transformer 42 are pulled out on the fuse 3's side and the switch 4's side which are the upper sides of the transformer 41 and the current transformer 42, and  
30 connected to the fuse 3 and the switch 4. The connection

position of the primary side charging portion 46 is higher than the connection position of the charging portion 52. An insulating distance becomes longer relative to a case in which the connection positions are the same position. With this, it is possible to simplify the insulating member of the charging portion for the long insulating distance. It is possible to dispose the transformer 41 near the current transformer 2, and to decrease the size of the charging portion. With this, it is possible to decrease the height and the depth directions of the electromagnetic contactor 1. Moreover, in this third embodiment, the charging portion 52 is disposed at a position which is higher than the iron core 44 of the transformer 41, and which is obliquely above the iron core 44 of the transformer 41. With this, it is possible to ensure a sufficient insulating distance relative to a case in which the charging portion 52 of the transformer 41 is disposed at a height position identical to that of the iron core 44, and specifically to decrease the depth direction of the electromagnetic contactor 1. Consequently, the load side conductor pulling-out portion 5 could be disposed between the lower side of the fuse 3 and the current transformer 42. Therefore, it became possible to decrease the size of the electromagnetic contactor 1.

[0040] As shown in FIG. 3, the load side conductor pulling-out portion 5 can select two kinds of pulling-out methods of a cable A pulled out to the back surface grounding portion 8, or a cable B pulled out in the left and right directions. With this, the pulled-out cable A or the pulled-out cable B can be pulled out to the back surface or in the left and right directions. Therefore, it became

possible to select the pulling-out methods in accordance with the situation, and to ease the cable pulling-out operation.

Next, the load side conductor pulling-out portion 5 and the  
5 insulating cover 56 shown in FIG. 1A are illustrated. The insulating cover 56 is disposed within the electromagnetic contactor to confront the back surface grounding portion 8, the fuses 3 and the load conductor pulling-out portion 5. The insulating cover 56 is made from the insulating  
10 member such as the insulating resin material.

[0041] As shown in FIG. 6, the insulating cover 56 covers and surrounds the end portions of the fuses which are on the back surface grounding portion side. The insulating cover 56 includes fuse chambers 61 each of which is  
15 formed within the insulating cover 56, and each of which receives the end portion of the fuse. There are formed power supply conductor chambers 63 between the fuse chamber side surface and the electromagnetic contactor floor surface by separating a portion between the fuse  
20 chamber side surface and the fuse chamber side surface by an insulating partition plate 62. A power supply conductor penetration passage 64 is formed within one of the power supply conductor chambers 63 to be orthogonal to the longitudinal direction of the fuse 3. The power supply  
25 conductor 2 penetrates the power supply conductor penetration passage 64 in the vertical direction.

[0042] There are formed load conductor pulling-out chambers 65 each formed below one of the fuse chamber 61 between the side surfaces of the power supply  
30 conductor chambers 63 adjacent to each other through the

insulating partition plate 62. A confronting surface of the load conductor pulling-out chamber 65 confronting the back surface grounding portion 8 is opened. There are provided load conductor supporting portions 57 on a ceiling surface of the load conductor pulling-out chamber 65. The load conductor supporting portion 57 supports the load conductor pulling-out portion 5.

[0043] An inlet 66 and a connection inlet 67 are provided to the fuse chamber 61, the load conductor pulling-out chamber 65 and the power supply conductor chamber 63 which are on a side opposite to the back surface grounding portion 8. The connection inlet 67 connects between the fuse chamber 61 and the power supply conductor chamber 63. The connection inlet 67 is also connected with the inlet 66. The power supply contact 22 passes from the inlet 66 and the connection inlet 67 to the power supply conductor chamber 63.

[0044] The fuse 3, the load side contact 53 and the power supply contact 22 are inserted from these inlet 66 and connection inlet 67. The fuse 3, the power supply contact 22 and the load side contact 53 are disposed in the fuse chamber 61, the power supply conductor chamber 63 and the load conductor pulling-out chamber 65. In this case, the power supply contact 22 can reach from the connection inlet 67 to the fuse chamber 61 and the power supply conductor chamber 63 without being disturbed.

Moreover, it is possible to increase a breakdown voltage of the fuse 3 by the insulating cover 56 disposed between the back surface grounding portion 8, the fuse 3 and the electromagnetic contact 22. As mentioned above, by the

present invention, it became possible to decrease the sizes of the electromagnetic contactor, the case and the combination structure of the electromagnetic contactor and the case. Moreover, it became possible to decrease the sizes of the case 6, and the combination of the electromagnetic contactor 1 and the case 6 by the size reduction of the electromagnetic contactor 1.

(Third Embodiment)

As shown in FIGS. 7 and 8, the longitudinal directions of the fuses 3 and the switches 4 are disposed in the vertical direction. The power supply conductor 2 are disposed in the direction identical to the longitudinal directions of the fuses so as to confront the longitudinal side surfaces of the fuses. With this, it is possible to considerably decrease the installation area of the electromagnetic contactor 1 relative to a case in which the fuses 3 and the switches 4 are disposed on the floor surface so that the longitudinal directions are horizontal. Other structures are substantially identical to those of the first and second embodiments. Repetitive illustrations are omitted.

### **Brief Description of Drawings**

[0045]

FIG. 1A is a side sectional view showing a schematic structure of the electromagnetic contactor according to embodiments of the present invention.

FIG. 1B is an enlarged sectional view showing a left side portion of FIG. 1A.

FIG. 1C is an enlarged sectional view showing a right side portion of FIG. 1A.

FIG. 2 is a sectional view taken along a section line A-A of FIG. 1A.

FIG. 3 is a sectional view taken along a section line B-B of FIG. 1A.

5        FIG. 4 is a schematic front view showing a transformer used in FIG. 1 to FIG. 3.

FIG. 5 is a schematic front view showing a current transformer used in FIG. 1 to FIG. 3.

10       FIG. 6 is a sectional view taken along a section line C-C of FIG. 1A.

FIG. 7 is a longitudinal sectional view showing an electromagnetic contactor according to a third embodiment.

15       FIG. 8 is a schematic side view showing the electromagnetic contactor according to the third embodiment.

FIG. 9 is an illustration view showing a conventional example.

FIG. 10 is an illustration view showing another conventional example.

## 20    **Illustration of Sign**

[0046]    1...electromagnetic contactor, 2...power supply conductor, 3...fuse, 4...switch, 5...load side conductor pulling-out portion, 6...case, 7...insertion hole, 8...back surface grounding portion, 9...electromagnetic contactor floor surface, 10...wheels, 11...intermediate supporting plate, 12...supporting column, 13...screw, 14...partition plate, 15A, 15b...sandwiching clamps, 16...cylindrical main body of the fuse, 17...power supply side terminal, 18...load side terminal, 19...fastening device, 21...relay conductor, 22...power supply contact, 23...operating portion,

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24...contact, 25...movable side conductor, 26...insulator,  
 27...wipe spring, 31...fix side conductor, 32...insulating  
 supporting portion, 33...fastening means, 41...transformer,  
 42...current transformer, 44...iron core, 45...insulating  
 5 cylinder, 46...primary side charging portion, 46A...primary  
 side lead, 46B...secondary side lead, 47...protection fuse,  
 52...charging portion, 52A...primary side lead,  
 52B...secondary side lead, 53...load side contact,  
 56...insulating cover, 57...load conductor supporting  
 10 portion, 61...fuse chamber, 62...insulating partition plate,  
 63...power supply conductor chamber, 64...power supply  
 conductor penetrating passage, 65...load conductor pulling-  
 out chamber, 66...inlet, 67...connection inlet, 51...iron  
 core

**CLAIMS**

1    1.                                    An electromagnetic contactor  
2    arranged to supply multi-phase electric powers from power  
3    supply conductors which are bus bars through fuses and  
4    switches to a load conductor, the electromagnetic contactor  
5    comprising: the fuses disposed within the electromagnetic  
6    contactor so as to direct longitudinal directions toward a  
7    depth side of the electromagnetic contactor; and the power  
8    supply conductors which are the bus bars, which are  
9    orthogonal to the longitudinal directions of the fuses, and  
10   each of which is disposed between the fuses, or on a  
11   longitudinal side surface of one of the fuses, the power  
12   supply conductors being electrically connected to the fuses.

1    2.                                    An electromagnetic contactor  
2    arranged to supply multi-phase electric powers from power  
3    supply conductors which are bus bars through fuses and  
4    switches to a load conductor, the electromagnetic contactor  
5    comprising: the fuses and the switches which are disposed  
6    on a same plane within the electromagnetic contactor so as  
7    to direct longitudinal directions toward a depth side of the  
8    electromagnetic contactor; and the power supply  
9    conductors which are the bus bars, which are orthogonal to  
10   the longitudinal directions of the fuses, and each of which  
11   is disposed between the fuses, or on a longitudinal side  
12   surface of one of the fuses, the power supply conductors  
13   being electrically connected to the fuses.

1    3.                                    An electromagnetic contactor  
2    arranged to supply multi-phase electric powers from power

3 supply conductors which are bus bars through fuses and  
4 switches to a load conductor, the electromagnetic contactor  
5 comprising: the fuses disposed within the electromagnetic  
6 contactor so as to direct longitudinal directions toward a  
7 depth side of the electromagnetic contactor; the switches  
8 which are disposed so that longitudinal directions are  
9 directions identical to the longitudinal directions of the  
10 fuses, and which are superimposed on the fuses; and the  
11 power supply conductors which are the bus bars, which are  
12 orthogonal to the longitudinal directions of the fuses, and  
13 each of which is disposed between the fuses, or on a  
14 longitudinal side surface of one of the fuses, the power  
15 supply conductors being electrically connected to the fuses.

1 4. An electromagnetic contactor  
2 arranged to supply multi-phase electric powers from power  
3 supply conductors which are bus bars through fuses and  
4 switches to a load conductor, the electromagnetic contactor  
5 comprising: the fuses disposed on an intermediate  
6 supporting plate of the electromagnetic contactor so as to  
7 direct longitudinal directions toward a depth side of the  
8 electromagnetic contactor; the power supply conductors  
9 which are the bus bars, which are orthogonal to the  
10 longitudinal directions of the fuses, and each of which is  
11 disposed between the fuses, or on a longitudinal side  
12 surface of one of the fuses; the switches mounted on the  
13 intermediate supporting plate which is opposite to a surface  
14 on which the fuses are disposed so as to direct longitudinal  
15 directions toward the depth side of the electromagnetic  
16 contactor; a potential transformer and a current

17 transformer disposed between the fuses, the switches and  
18 an electromagnetic contactor floor surface; and a primary  
19 side charging portion of the potential transformer and a  
20 charging portion of the current transformer which are  
21 electrically connected to the fuses and the switches which  
22 are disposed on an upper side of the potential transformer  
23 and the current transformer.

1 5. An electromagnetic contactor  
2 arranged to supply multi-phase electric powers from power  
3 supply conductors which are bus bars through fuses and  
4 switches to a load conductor, the electromagnetic contactor  
5 comprising: the fuses disposed on an intermediate  
6 supporting plate of the electromagnetic contactor so as to  
7 direct longitudinal directions toward a depth side of the  
8 electromagnetic contactor; the power supply conductors  
9 which are the bus bars, which are orthogonal to the  
10 longitudinal directions of the fuses, and each of which is  
11 disposed between the fuses, or on a longitudinal side  
12 surface of one of the fuses; the switches mounted on the  
13 intermediate supporting plate which is opposite to the  
14 surface on which the fuses are disposed so as to direct  
15 longitudinal directions toward a depth side of the  
16 electromagnetic contactor; a potential transformer and a  
17 current transformer disposed between the fuses, the  
18 switches and an electromagnetic contactor floor surface; a  
19 primary side charging portion of the potential transformer  
20 and a charging portion of the current transformer which are  
21 connected to the fuses and the switches that are disposed  
22 on an upper side of the potential transformer and the

23 current transformer; a load side contact connected to the  
24 charging portion of the current transformer, and connected  
25 to a load conductor pulling-out portion; the load conductor  
26 pulling-out portion disposed between a back surface  
27 grounding portion closing a depth of the electromagnetic  
28 contactor, and the fuses and the current transformer which  
29 confront the electromagnetic contactor floor surface.