

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 through fuses and switches to a load conductor, the electromagnetic contactor includes: the fuses disposed within the
10 electromagnetic contactor so as to direct longitudinal directions toward a depth side of the electromagnetic contactor; and the power supply conductors which are orthogonal to the longitudinal directions of the fuses, and which are disposed so as to confront longitudinal side
15 surfaces 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-phase electric powers from power supply conductors
20 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 longitudinal directions toward a depth side of the electromagnetic
25 contactor; and the power supply conductors which are orthogonal to the longitudinal directions of the fuses, and which are disposed so as to confront longitudinal side surfaces 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 through fuses and switches to a load conductor, the electromagnetic
5 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
10 longitudinal directions of the fuses, and which have one ends on which the fuses are superimposed; and the power supply conductors which are orthogonal to the longitudinal directions of the fuses, and which are disposed so as to confront longitudinal side surfaces of the fuses, the power
15 supply conductors being electrically connected to the fuses.

[0009] In the fourth according to the present invention, an electromagnetic contactor arranged to supply multi-phase electric powers from power supply conductors through fuses and switches to a load conductor, the
20 electromagnetic contactor includes: the fuses and the switches which confront each other, and which are disposed so as to direct longitudinal directions in a vertical direction; and the power supply conductors extending in a direction identical to the longitudinal directions of the fuses, and
25 confronting longitudinal side surfaces of the fuses, the power supply conductors being electrically connected to the fuse.

[0010] In the fifth according to the present invention, an electromagnetic contactor arranged to supply multi-phase
30 electric powers from power supply conductors 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 contactors; the power supply conductors which are orthogonal to the longitudinal directions of the fuses, and which are disposed so as to confront longitudinal side surfaces 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 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 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 transformer and the current transformer.

[0011] In the sixth according to the present invention, an electromagnetic contactor arranged to supply multi-phase electric powers from power supply conductors 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 disposed so as to be orthogonal to the longitudinal directions 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 transformer and a current transformer disposed between the fuse, the switches and an electromagnetic contactor floor surface; a primary side
5 charging portion of the transformer and a charging portion of the current transformer which are connected to the fuses and the switches which are disposed on an upper side of the transformer and the current transformer; a load side contact connected to the charging portion of the current
10 transformer, and connected to a load conductor pulling portion; the load conductor pulling portion disposed between a back surface grounding portion closing a depth of the electromagnetic contactor, and the fuses and the current transformer which confront the electromagnetic
15 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 of the combination of the electromagnetic contactor and
20 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 in the longitudinal direction so as to be orthogonal to the longitudinal side surface of one of the
25 fuses for one phase. Therefore, it is possible to decrease the depth of the case of the electromagnetic contactor, and to facilitate the mounting operation in the depth direction. Moreover, in the present invention, it is possible to decrease the height size of the electromagnetic contactor
30 by an amount that the longitudinal directions of the

switches are disposed in the directions identical to the longitudinal directions of the fuses, relative to a case in which the longitudinal directions of the switches are disposed in the height directions.

- 5 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 depth size of the case. Moreover, it is possible to decrease the height size of the electromagnetic contactor, to
10 decrease the case of the multistage stacked electromagnetic contactor that the electromagnetic contactors are stacked, and to stack more the electromagnetic contactors when the cases have an identical height.

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

[0013] (First Embodiment)

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

- [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
30 and switches 4 to load conductor pulling-out portions 5.

[0016] The electromagnetic contactor 1 is received within 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. 3, the intermediate supporting plate 11 is supported on the electromagnetic contactor floor surface 9 by a plurality of supporting columns 12. Moreover, as shown in FIG. 2, 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

5 illustrated.

[0021] The fuse 3 includes a cylindrical body portion
(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.

10 These terminals 17, 18 are inserted into the sandwiching
clamps 15A, 15B. The sandwiching clamps 15A, 15B are
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
15 vertical direction to be orthogonal to a longitudinal side
surface of the fuse 3. The power supply side terminal 17
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
20 side terminal 17. The relay conductor 21 protrudes from
the lower side (cf. FIG. 6) of the cylindrical portion 16
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
25 orthogonal to the cylindrical portion 12. A power supply
contact 22 is fixed to this protruding end of the relay
conductor 21.

[0023] In the power supply contact 22, the number of
the contact pieces is increased or decreased in accordance
30 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
5 electrical disconnection are achieved by contacting or 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.

10 [0025] The electric power from the power supply 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
15 terminal 18. As shown in FIG. 1C, the load side terminal 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
20 accordance with the current-carrying capacity so as to 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
25 back surface grounding portion 8. The switch 4 is disposed 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
30 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. 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.

20 [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 4's side which is on the upper side of the current transformer 42.

25 [0039] As described above, the primary side charging 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 obliquely at a position higher than 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 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 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 member such as the insulating resin material.

10 [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 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 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 conductor 2 penetrates the power supply conductor penetration passage 64 in the vertical direction.

25 [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 conductor chambers 63 adjacent to each other through the insulating partition plate 62. A confronting surface of the

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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 (dielectric 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. 1.

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

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. 1.

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 arranged to supply
2 multi-phase electric powers from power supply conductors
3 through fuses and switches to a load conductor, the
4 electromagnetic contactor comprising: the fuses disposed
5 within the electromagnetic contactor so as to direct
6 longitudinal directions toward a depth side of the
7 electromagnetic contactor; and the power supply
8 conductors which are orthogonal to the longitudinal
9 directions of the fuses, and which are disposed so as to
10 confront longitudinal side surfaces of the fuses, the power
11 supply conductors being electrically connected to the fuses.

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

1 3. An electromagnetic contactor arranged to supply
2 multi-phase electric powers from power supply conductors
3 through fuses and switches to a load conductor, the
4 electromagnetic contactor comprising: the fuses disposed

5 within the electromagnetic contactor so as to direct
6 longitudinal directions toward a depth side of the
7 electromagnetic contactor; the switches which are disposed
8 so that longitudinal directions are directions identical to the
9 longitudinal directions of the fuses, and which have one
10 ends on which the fuses are superimposed; and the power
11 supply conductors which are orthogonal to the longitudinal
12 directions of the fuses, and which are disposed so as to
13 confront longitudinal side surfaces of the fuses, the power
14 supply conductors being electrically connected to the fuses.

1 4. An electromagnetic contactor arranged to supply
2 multi-phase electric powers from power supply conductors
3 through fuses and switches to a load conductor, the
4 electromagnetic contactor comprising: the fuses and the
5 switches which confront each other, and which are disposed
6 so as to direct longitudinal directions in a vertical direction;
7 and the power supply conductors extending in a direction
8 identical to the longitudinal directions of the fuses, and
9 confronting longitudinal side surfaces of the fuses, the
10 power supply conductors being electrically connected to the
11 fuse.

1 5. An electromagnetic contactor arranged to supply
2 multi-phase electric powers from power supply conductors
3 through fuses and switches to a load conductor, the
4 electromagnetic contactor comprising: the fuses disposed
5 on an intermediate supporting plate of the electromagnetic
6 contactor so as to direct longitudinal directions toward a
7 depth side of the electromagnetic contactors; the power

8 supply conductors which are orthogonal to the longitudinal
9 directions of the fuses, and which are disposed so as to
10 confront longitudinal side surfaces of the fuses; the
11 switches mounted on the intermediate supporting plate
12 which is opposite to a surface on which the fuses are
13 disposed so as to direct longitudinal directions toward the
14 depth side of the electromagnetic contactor; a transformer
15 and a current transformer disposed between the fuses, the
16 switches and an electromagnetic contactor floor surface;
17 and a primary side charging portion of the transformer and
18 a charging portion of the current transformer which are
19 electrically connected to the fuses and the switches which
20 are disposed on an upper side of the transformer and the
21 current transformer.

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

16 charging portion of the transformer and a charging portion
17 of the current transformer which are connected to the fuses
18 and the switches that are disposed on an upper side of the
19 transformer and the current transformer; a load side
20 contact connected to the charging portion of the current
21 transformer, and connected to a load conductor pulling-out
22 portion; the load conductor pulling-out portion disposed
23 between a back surface grounding portion closing a depth
24 of the electromagnetic contactor, and the fuses and the
25 current transformer which confront the electromagnetic
26 contactor floor surface.