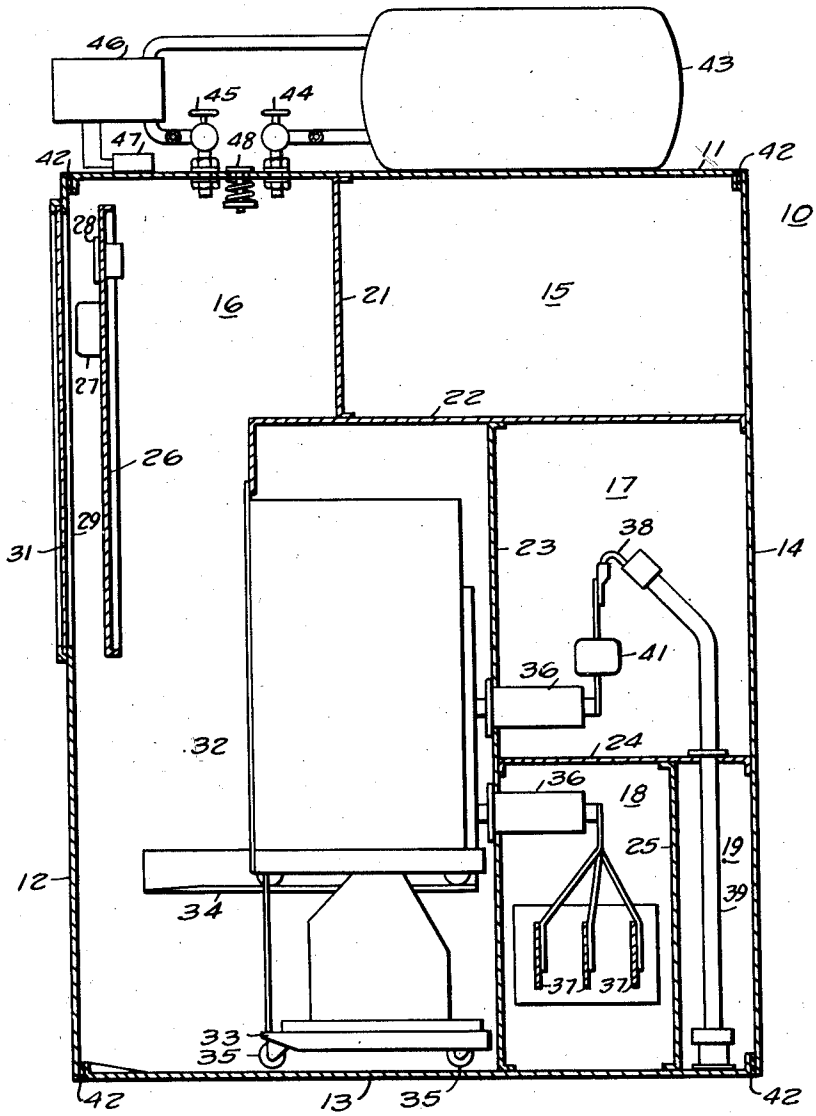
March 21, 1950 J. B. MacNEILL ET AL 2,501,345

METAL-CLAD SWITCHGEAR

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Fig. 1.



WITNESSES:

E. A. McCloskey.

N. B. Chilcoat

INVENTORS

John B. MacNeill and

Benjamin I. Hayford.

BY

G. W. Crawford

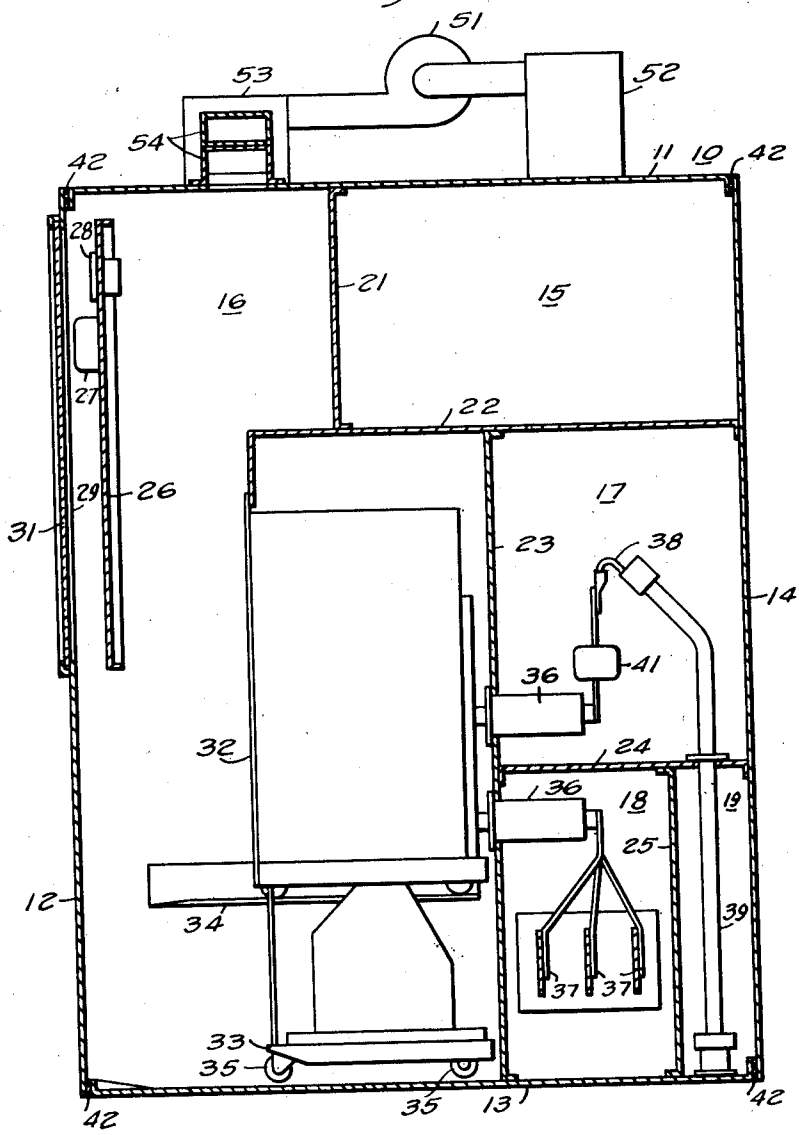
ATTORNEY

March 21, 1950 J. B. MacNEILL ET AL 2,501,345

METAL-CLAD SWITCHGEAR

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Fig. 2.



WITNESSES:

E. A. McKelvey

R. L. Chilcott

INVENTORS

John B. MacNeill and

Benjamin I. Hayford.

BY

G. M. Crawford

ATTORNEY

March 21, 1950 J. B. MacNEILL ET AL 2,501,345

METAL-CLAD SWITCHGEAR

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Fig. 3.

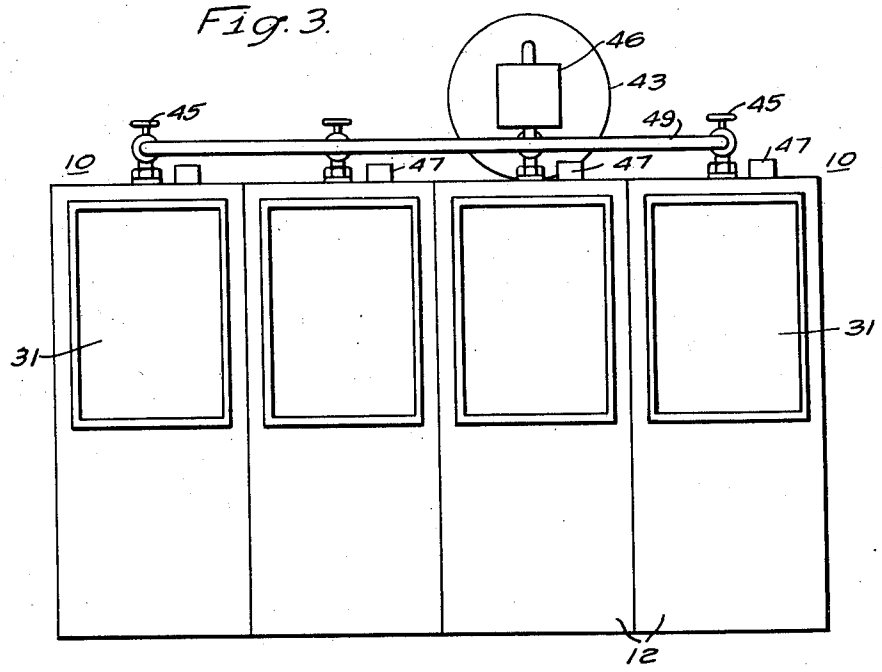
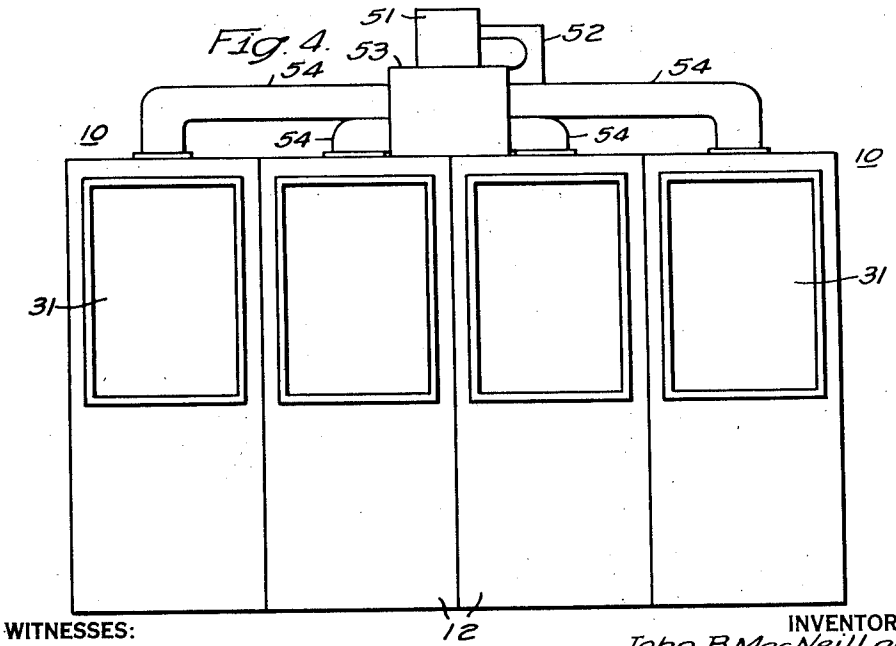


Fig. 4.



WITNESSES:

E. A. McCloskey.

INVENTORS

John B. MacNeill and
Benjamin I. Hayford.

BY

G. M. Crawford

ATTORNEY

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UNITED STATES PATENT OFFICE

2,501,345

METAL-CLAD SWITCHGEAR

John B. MacNeill and Benjamin I. Hayford, Pittsburgh, Pa., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application June 2, 1947, Serial No. 751,892

4 Claims. (Cl. 175—298)

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Our invention relates, generally, to electrical switchgear and, more particularly, to metal-clad switchgear which is suitable for use in corrosive or explosive atmospheres.

Heretofore, it has been customary to utilize oil-immersed switchgear apparatus in corrosive or explosive atmospheres since the interrupting devices have usually been oil-filled circuit breakers. However, air circuit breakers, which are suitable for such applications, are now available and it is desirable to provide a means for protecting the air circuit breakers and associated apparatus from corrosive or explosive atmospheres.

An object of our invention, generally stated, is to provide metal-clad switchgear which shall be simple and efficient in operation and which may be economically manufactured and installed.

A more specific object of our invention is to provide metal-clad switchgear suitable for use in corrosive or explosive atmospheres.

Another object of our invention is to provide for maintaining a predetermined pressure on the inside of metal-clad switchgear.

Other objects of our invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with one embodiment of our invention, an air circuit breaker and its associated apparatus are enclosed in a metal housing which contains a fluid, such as an inert gas. The pressure on the inside of the housing is automatically maintained above atmospheric pressure by regulating valves or by a fan.

For a better understanding of the nature and objects of our invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a view, partially in end elevation and partially in section, of a metal-clad switchgear structure embodying the principal features of the invention;

Fig. 2 is a view, partially in end elevation and partially in section, of a modification of our invention;

Fig. 3 is a reduced view, in front elevation, of the structure shown in Fig. 1; and

Fig. 4 is a reduced view, in front elevation, of the structure shown in Fig. 2.

Referring to the drawings, and particularly to Fig. 1, the metal-clad switchgear unit shown therein comprises a housing 10 having sheet-metal members 11, 12, 13 and 14 secured together to form a box-like structure. Side members are

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also provided to enclose the housing completely. The housing 10 may be divided into a plurality of compartments 15, 16, 17, 18 and 19, as shown, by sheet-metal partition members 21, 22, 23, 24 and 25.

In accordance with the usual practice, the front panel member 12 may be hinged to permit it to be opened readily to gain access to the compartment 16. A hinged panel 26 is disposed in the compartment 16 a short distance behind the front panel 12. The usual relays 27 and instruments 28 may be mounted on the panel 26 opposite an opening 29 in the front panel 12. The opening 29 may be covered by a sheet of glass 31, thereby permitting the instruments and relays to be observed without opening the front panel 12.

A circuit breaker unit 32, which is of the horizontal draw-out type, is also disposed in the compartment 16. As shown, the circuit breaker unit 32 is mounted upon a truck frame 33 which may be supported by rails 34 secured to the side members of the housing. When the truck frame 33 is removed from the housing, it runs upon wheels 35 provided at the bottom of the truck.

The circuit breaker unit 32 is provided with primary disconnecting contact members (not shown) which engage fixed contact members disposed inside of insulating shells 36 which are mounted upon the partition member 23. As shown, bus-bars 37 are mounted in the compartment 18 and are connected to the lower set of disconnecting contact members. The upper set of disconnecting contact members are connected to feeder cables 38 which are disposed in conduits 39 located in the rear compartment 19. Current transformers 41 may be located in the compartment 17 and connected to the feeder cables 38. If desired, potential transformers (not shown) may be located in the compartment 15.

In order that the apparatus may be utilized in corrosive or explosive atmospheres, all exterior joints are tightly sealed by gaskets 42 and the housing is filled with an inert gas, such as nitrogen or air which has been made substantially non-corrosive and substantially non-explosive. Furthermore, all conduit and bus entry points are sealed against gas leakage.

The gas may be supplied from a high pressure tank or reservoir 43 through an inlet valve 44. The valve 44 may be of a type which will release gas from the reservoir 43 to increase the gas within the housing when the pressure within the housing falls below a predetermined amount.

If the pressure within the housing increases above a predetermined amount, as it would if the temperature rises, gas is discharged through an exhaust valve 45 and returned to the high pressure reservoir 43 by an electrically driven pump 46. The operation of the pump 46 may be controlled by a relay 47 of the pressure-operated type. In this manner, the pressure within the housing 10 may be maintained above atmospheric pressure, thereby excluding undesirable atmospheres since any leakage will be from the inside of the housing to the outside atmosphere.

A high pressure relief valve 48 may be provided when the switchgear is utilized under corrosive atmospheric conditions. The valve 48 will function to relieve the high pressure developed during the interruption of a fault current by the circuit breaker. Under explosive conditions the housing should be made strong enough to withstand the pressure developed during a fault interruption.

As shown in Fig. 3, a plurality of units 10 of the type shown in Fig. 1 may be disposed in side-by-side relation. The gas for all of the units may be supplied from a single reservoir 43 which is connected to the units by suitable piping 49. One pump 46 may be utilized to return the gas from all of the units to the reservoir 43. The pump 46 may be so controlled by the pressure responsive relays 47 that it will be operated when the pressure in any one of the cells exceeds a predetermined amount.

In the modification of the invention shown in Fig. 2, in which like parts are designated by the same reference characters as in Fig. 1, a motor driven fan 51 is utilized to maintain the air pressure within the housing 10 above atmospheric pressure. The air brought into the housing is passed through filtering equipment 52 to remove all corrosive and explosive elements from the air.

Since the pressure within the housing is maintained above atmospheric pressure, any leakage taking place will be from within the housing to the outside atmosphere. Therefore, the equipment may be safely installed in corrosive or explosive atmospheres.

As shown in Figs. 2 and 4, one fan 51 and one set of filtering equipment 52 may be utilized to provide air for a plurality of units. A reservoir 53 which is common to all of the units is connected to the fan 51. Each unit may be connected to the reservoir 53 by an individual duct 54 thereby avoiding directly communicating openings between breaker compartments. The other features of the structure shown in Figs. 2 and 4 are similar to those hereinbefore described.

From the foregoing description, it is apparent that we have provided switchgear apparatus which may be utilized in industries, such as oil refining and chemical processing, which have explosive or corrosive atmospheres. All of the apparatus which cannot be safely exposed to such atmospheres is completely enclosed within the housing from which the outside atmosphere is excluded. In this manner, apparatus of a standard design, which otherwise could not be used under such conditions, may be utilized without requiring changes or modifications in the apparatus.

Since numerous changes may be made in the above described construction and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim as our invention:

1. A multi-unit metal-clad switchgear structure comprising, a plurality of cells disposed side-by-side, an air circuit breaker disposed in each cell, said cells containing an inert gas, reservoir means common to all of the cells for maintaining a predetermined gas pressure in each cell, pump means for returning said gas from said cells to said reservoir means, and relay means responsive to the gas pressure in said cells for controlling the operation of the pump means.

2. A multi-unit metal-clad switchgear structure comprising, a plurality of cells disposed side-by-side, an air circuit breaker disposed in each cell, said cells containing a fluid, reservoir means common to all of the cells for maintaining the fluid pressure in said cells above atmospheric pressure, pump means common to all of the cells for returning said fluid from said cells to said reservoir means, and relay means responsive to the fluid pressure in each cell for controlling the operation of said pump means.

3. A metal-clad switchgear unit comprising, a housing, an air circuit breaker disposed in the housing, a reservoir containing an inert gas under pressure, pressure regulating valve means for admitting said gas into said housing from said reservoir, additional pressure regulating valve means for exhausting said gas from said housing, pump means for returning said gas to said reservoir under pressure, and pressure-actuated means for controlling the operation of said pump means.

4. A metal-clad switchgear unit comprising, a housing, a circuit breaker disposed in the housing, a reservoir containing a fluid under pressure, pressure regulating valve means for admitting said fluid into said housing from said reservoir, relief valve means for relieving an excessive pressure within the housing, additional pressure regulating valve means for exhausting said fluid from said housing, pump means for returning said fluid to said reservoir under pressure, and relay means responsive to the pressure within the housing for controlling the operation of said pump means.

JOHN B. MACNEILL.
BENJAMIN I. HAYFORD.

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