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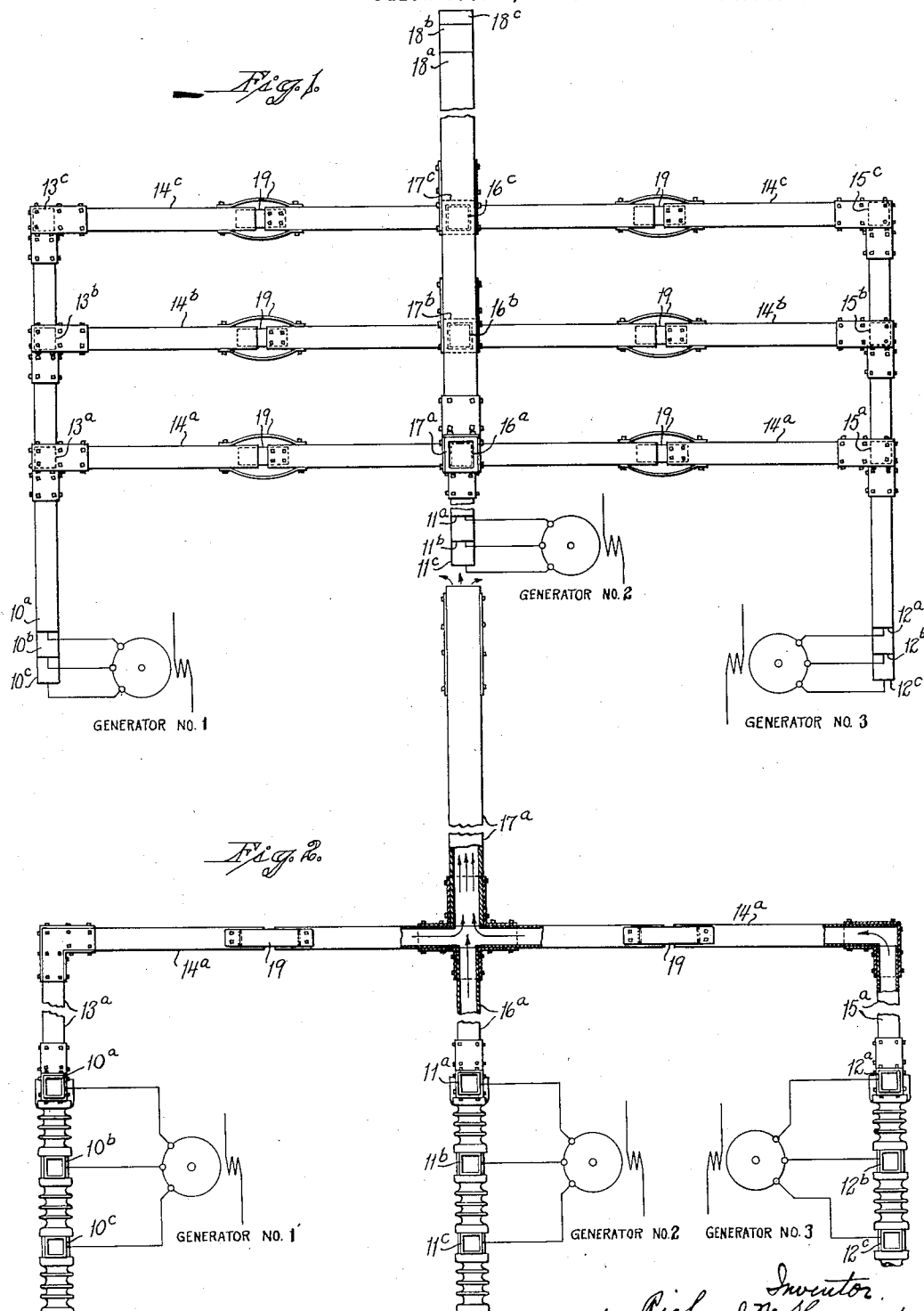
R. W. SHOEMAKER

2,033,743

SELF COOLING BUS SYSTEM FOR ELECTRICAL INSTALLATIONS

Filed Oct. 2, 1934

2 Sheets-Sheet 1



Inventor
Richard W. Shoemaker
Seymour Earle Nichols
attorney

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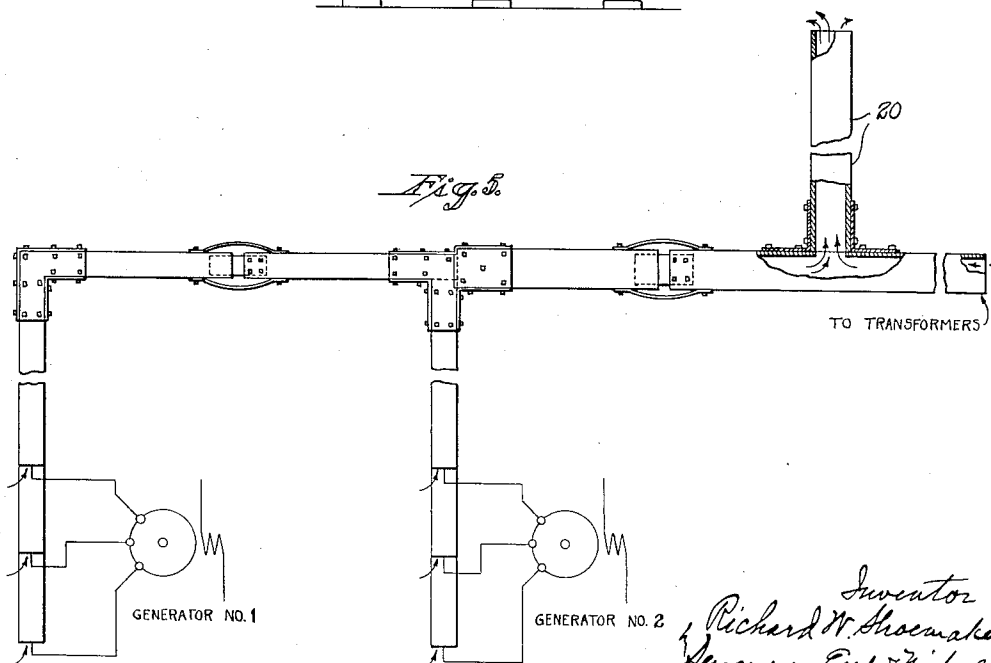
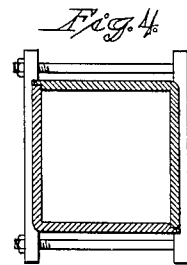
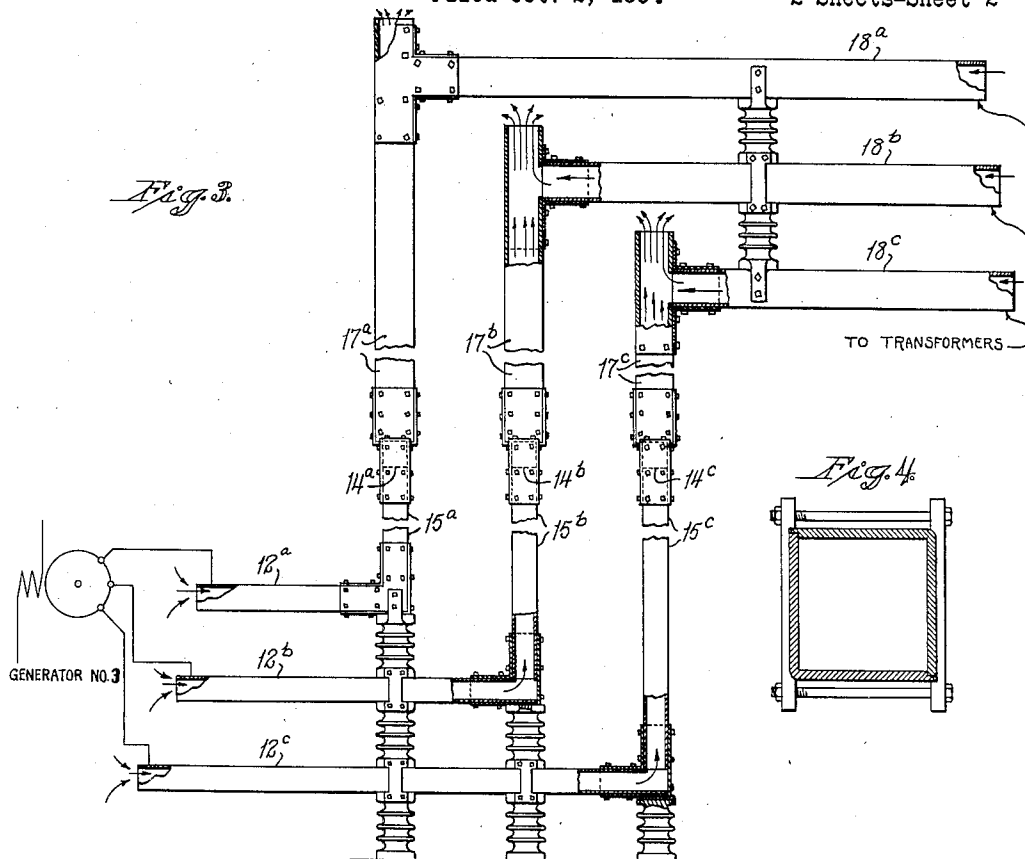
R. W. SHOEMAKER

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SELF COOLING BUS SYSTEM FOR ELECTRICAL INSTALLATIONS

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Inventor
Richard W. Shoemaker
Seymour Earl Nichols
attys

UNITED STATES PATENT OFFICE

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SELF-COOLING BUS-SYSTEM FOR
ELECTRICAL INSTALLATIONSRichard W. Shoemaker, Waterbury, Conn., as-
signor to The Chase Companies, Incorporated,
Waterbury, Conn., a corporation

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6 Claims. (Cl. 173-13)

This invention relates to bus-systems for electrical installations and particularly to self-cooling bus-systems for such installations.

One of the major problems in bus-systems has been to effectively dissipate the extensive and undesirable heat developed therein as an incident to the flow of high currents therethrough. Such heat not only materially decreases the conductivity of the system but also produces such degrees of expansion, etc., as tend to mechanically disrupt the system and which it is difficult to compensate for without undue complexity of supports, guides, braces, etc.

Efforts have heretofore been made to dissipate the heat referred to by providing composite bus-bars, the component elements of which have been spaced from each other in the hope that cross-wise movement of air therebetween would ameliorate the condition referred to. Very complete and exhaustive tests have shown, however, that the amount of heat dissipated by such composite bus-bars with their laterally-spaced elements is so relatively negligible as not to be worth the effort and complexity necessary to their construction and installation. Furthermore, protective coverings, supports, etc., have served to block off or retard the lateral flow of air, thereby further minimizing the already negligible cooling effect.

One of the objects of the present invention is to provide a superior bus-system which will be self-cooling to an effective degree.

A further object is to provide a superior bus-system in which cooling currents of air will be caused to flow lengthwise of the bus-bars at velocities sufficient to effectively cool the same.

Other objects and advantages will appear to those skilled in the art from the following, considered in conjunction with the accompanying drawings and the appended claims.

In the accompanying drawings:
Fig. 1 is a schematic top or plan view of one form which a bus-system embodying the present invention may assume;

Fig. 2 is a view thereof in front elevation;

Fig. 3 is a view thereof in end elevation;

Fig. 4 is a transverse sectional view showing a two-part tubular bus-bar; and

Fig. 5 is a schematic representation of another form of convector bus-system embodying the present invention.

The bus-system schematically shown in Figs. 1 to 3 inclusive is designed to serve in connection with a plurality of three-phase generators, three of which latter are indicated. The particular bus-system herein chosen for illustration in the

said figures includes three corresponding sets of horizontal tubular feeder-runs, respectively comprising parallel tubes 10^a 10^b 10^c, 11^a 11^b 11^c and 12^a 12^b 12^c. The horizontal runs referred to are preferably of rectangular cross-section, and may be formed of solid drawn tubes, as shown in Figs. 1 to 3 inclusive, or may be built up of sections organized into a tubular unit as shown in Fig. 4, the desired characteristic being flue-like tubes or air-conduits free or substantially free of lateral openings of such extent as would permit a sufficient amount of air to leak laterally inwardly to disrupt the longitudinal high-velocity cooling effect to be later described.

The outer or forward ends of the set of horizontal feeder-runs 10^a 10^b 10^c are connected in a suitable manner to a three-phase generator marked "Generator No. 1" in the accompanying drawings. Similarly, the horizontal feeder-runs bearing the reference characters 11^a 11^b 11^c serve a three-phase generator marked "Generator No. 2," while the corresponding runs bearing reference characters 12^a 12^b 12^c serve, in turn, to connect a three-phase generator marked "Generator No. 3" into the system.

The respective rear ends of the set of horizontal feeder-runs 10^a 10^b 10^c are secured by suitable coupling-plates to upstanding feeder-runs 13^a 13^b 13^c, connected, in turn, at their respective upper ends to the adjacent ends of horizontal tubular runs 14^a 14^b 14^c which latter, for convenience of description, may be designated as "collector-runs." The opposite ends of the horizontal collector-runs 14^a 14^b 14^c are connected to the respective rear ends of the horizontal feeder-runs 12^a 12^b 12^c by means of vertical tubular feeder-runs 15^a 15^b 15^c. The respective central portions of the collector-runs 14^a 14^b 14^c are, in turn, connected to the respective rear ends of the horizontal feeder-runs 11^a 11^b 11^c by means of vertical tubular feeder-runs 16^a 16^b 16^c.

Upstanding from the center of the respective collector-runs 14^a 14^b 14^c are vertical tubular main-runs 17^a 17^b 17^c which are of relatively-larger size and of heavier material than the previously-described runs, for the reason that they must convey the entire current output of all three of the generators 1, 2 and 3.

By reference to Fig. 3 in particular, it will be noted that the respective upper end of each of the vertical main-runs 17^a 17^b 17^c is open to permit the egress of heated air in a manner as will be hereinafter described. Extending rearwardly from each of the said vertical main-runs 17^a 17^b 17^c respectively, are horizontal tubular main-

runs 18^a 18^b 18^c which may lead to appropriate transformers, as indicated on the drawings.

By reference to the drawings, it will also be seen that where the various runs before described are connected, one into the other, the construction and arrangement is of such type as to provide a continuous flue or conduit for the longitudinal high-velocity passage of cooling air through the interior of the various runs. Thus, the open upper end of the vertical main-run 17^a serves as an outlet for initially-cool air entering the unit comprising the runs 14^a 10^a 13^a 11^a 16^a 12^a 15^a through the open outer or forward ends of the horizontal feeder-runs 10^a 11^a 12^a.

In a similar manner the open upper end of the vertical main run 17^b serves as an outlet for air entering the unit comprising the runs 14^b 10^b 13^b 11^b 16^b 12^b 15^b through the open forward or outer ends of the horizontal feeder-runs 10^b 11^b 12^b.

Likewise, the open upper end of the vertical main-run 17^c serves as an outlet for the air entering the unit comprising the runs 14^c 10^c 13^c 11^c 16^c 12^c 15^c through the open forward or outer ends of the horizontal feeder-runs 10^c 11^c 12^c.

In addition to serving as cents or chimneys for the various runs above described, the vertical main-runs 17^a 17^b 17^c respectively serve as vents for air passing as indicated in Fig. 3 from the rearwardly-extending horizontal main-runs 18^a 18^b 18^c.

When heating occurs, due to the passage of current through the various tubular bus-runs, the air within the same will become heated and a longitudinal draft of air will be drawn through each tubular unit by the convector action provided by the cumulative chimney effect of the various vertical runs. This air will travel at a relatively-high velocity due to the convector action already referred to, which velocity will be "boosted," so to speak, by each of the various vertical runs forming part of a given flue-like bus-unit. This effect is made possible by having the various runs both vertical and horizontal, free or substantially free of interior obstructions and of lateral openings, which latter in particular, if present in the structure, would tend to inhibit or otherwise interfere with the convector action referred to, which is exceedingly efficient in cooling the various tubular units of the system.

In the schematic representation of the bus-system, many spacing and bracing insulators have been omitted for clarity of illustration. The required number and location of insulators to form a sufficiently rigid-structure will be obvious to those skilled in the art, as will also be the location of expansion-joints 19, etc., such as are shown in the collector-runs 14^a 14^b 14^c, and which expansion-joints may be duplicated in accordance with well understood practice wherever they are needful, and no effort has been made to show all of the expansion-joints, etc., which might be desired in the various runs of the system.

In Figs. 1 to 3 inclusive, the tubular bus-members are shown as solid in cross-section, but the same, if desired and for convenience of construction and erection, may be built up of sections as illustrated in Fig. 4, so long as they preserve a substantially-continuous tubular structure in contradistinction to laterally-spaced members providing transverse air-passages which would preclude the successful operation

of the highly-effective convector action before described.

In bus installations which terminate in horizontal runs such as illustrated in Fig. 5, it is desirable to provide a chimney or stack such as 20, in order to build up a maximum draft or convector action and thus induce a rapid movement of air longitudinally through the various runs of the bus-system.

It has been found that by assembling together both vertical and horizontal tubular elements having their interior passages interconnected and free or substantially free of both interior obstructions and lateral leakage, a cooling effect is obtained which so far exceeds the cooling effect obtained by lateral ventilation as heretofore proposed, as to render the latter comparatively negligible.

The various runs of the bus-system may be referred to as being imperforate or substantially imperforate for the reason that although certain openings for bolts, rivets, etc., may be formed therein, the said openings are so effectively closed as to provide interconnected angularly-disposed air-ducts sufficiently free of lateral air-openings as to function as described.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are therefore to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A bus-system comprising: a substantially-horizontal tubular bus-member providing a substantially-imperforate air-duct; and a substantially-vertical tubular bus-member extending from the said substantially-horizontal bus-member and also providing a substantially-imperforate air-duct; the said substantially-horizontal bus-member and the said substantially-vertical bus-member having their interior passages connected in a substantially-air-tight manner to provide a continuous angular air-duct; the lowermost one of said bus-members having an air-inlet opening, and the uppermost one thereof having an air-egress opening located in a plane above the air-inlet opening of the other of said bus-members; whereby, upon the bus-system becoming heated by the passage of current there-through, the said substantially-vertical bus-member will act as a convector and force cooling air not only through itself, but through the said substantially-horizontal bus-member to cool both of the same by a longitudinally-flowing high-velocity air-current.

2. A bus-system comprising: a substantially-horizontal tubular bus-member providing a substantially-imperforate air-duct; and a substantially-vertical tubular bus-member upwardly extending from the said horizontal bus-member and also providing a substantially-imperforate air-duct; the said substantially-horizontal bus-member and the said substantially-vertical bus-member extending upwardly therefrom having their interior passages connected in a substantially-air-tight manner to provide a continuous angular air-duct; the said substantially-horizontal bus-member having an air-inlet opening at a point remote from its connection to the said substantially-vertical bus-member, which latter is provided in a plane above the said horizontal bus-

member with an air-egress opening; whereby, upon the bus-system becoming heated by the passage of current therethrough, the said substantially-vertical bus-member will act as a convector and create a draft to draw cooling air from the said substantially-horizontal bus-member upwardly through itself.

3. A bus-system comprising: a substantially-horizontal tubular bus-member providing a substantially-imperforate air-duct; and a plurality of substantially-vertical tubular bus-members extending from the said substantially-horizontal bus-member, and also providing substantially-imperforate air-ducts; each of the said substantially-vertical bus-members having its interior passage connected in a substantially-air-tight manner to the interior passage of the said substantially-horizontal bus-member and each having an air-inlet opening; the said substantially-horizontal bus-member having an air-egress opening located above the air-inlet openings of said substantially-vertical bus-members; whereby, upon the bus-system becoming heated by the passage of current therethrough, the said substantially-vertical bus-members will act as convectors and force cooling air not only through themselves, but through the said substantially-horizontal bus-member.

4. A bus-system comprising: a substantially-horizontal tubular bus-member providing a substantially-imperforate air-duct; a substantially-vertical tubular bus-member downwardly extending from the said substantially-horizontal bus-member and also providing a substantially-imperforate air-duct; and a substantially-vertical tubular bus-member upwardly-extending from the said substantially-horizontal bus-member and providing a substantially-imperforate air-duct; both of the said substantially-vertical bus-members having their interior passages connected in a substantially-air-tight manner to the interior of the said substantially-horizontal bus-member to provide a continuous air-duct, in which the latter bus-member is included; the downwardly extending one of the said substantially-vertical bus-members having an air-inlet opening and the upwardly extending one thereof having an air-egress opening located above the air

inlet opening of said downwardly-extending bus-member; whereby, upon the bus-system becoming heated by the passage of current therethrough, the said substantially-vertical bus-members will act as convectors and force cooling air through the system to cool the same.

5. A bus-system comprising: a substantially-horizontal tubular bus-member providing a substantially-imperforate air-duct and having an air-inlet opening; a plurality of substantially-vertical tubular bus-members extending from the said substantially-horizontal bus-member and also providing substantially-imperforate air-ducts, and connected in a substantially-air-tight manner to the interior of the said substantially-horizontal bus-member; at least one of the said substantially-vertical tubular bus-members extending upwardly from the said substantially-horizontal bus-member and having an air egress opening located above the air-inlet opening of the said substantially-horizontal bus-member.

6. A bus-system comprising: a substantially-horizontal tubular collector bus-member providing a substantially-imperforate air-duct; a plurality of substantially-vertical tubular feeder bus-members downwardly extending from the said substantially-horizontal bus-member and also providing substantially-imperforate air-ducts; a substantially-vertical tubular main bus-member upwardly extending from the said collector bus-member and also providing a substantially-imperforate air-duct; the said tubular main bus-member and the said tubular feeder bus-members having their interior passages connected in a substantially-air-tight manner to the interior passage of the said substantially-horizontal collector bus-member; the said feeder bus-members each having an air-inlet opening and the said upwardly extending main bus-member having an air-egress opening located above the air-inlet openings of the said feeder bus-members; whereby, upon the bus-system becoming heated by the passage of current therethrough, the said substantially-vertical bus-members will act as convectors and force cooling air through the bus-system to cool the same.

RICHARD W. SHOEMAKER.