

Jan. 7, 1941.

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2,228,105

VERTICAL GENERATOR

Filed April 21, 1938

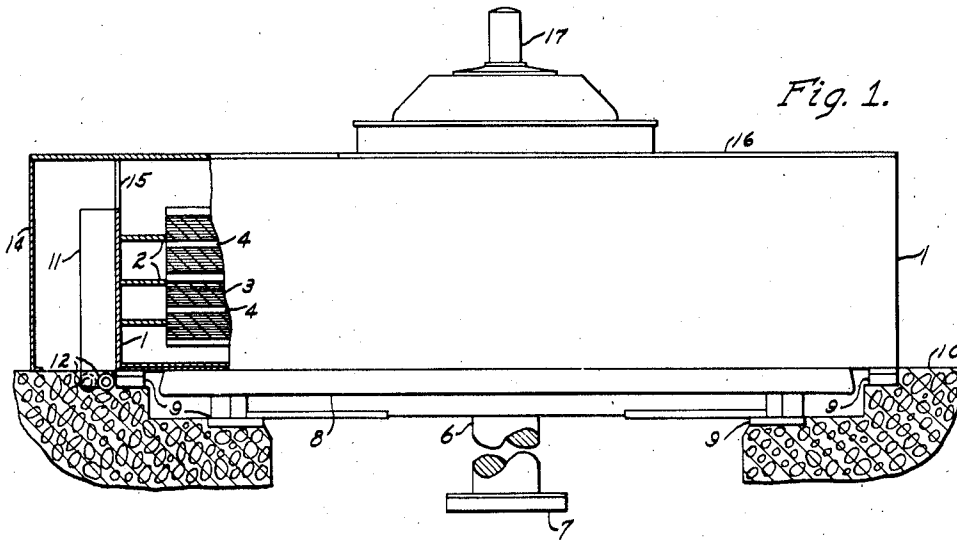


Fig. 1.

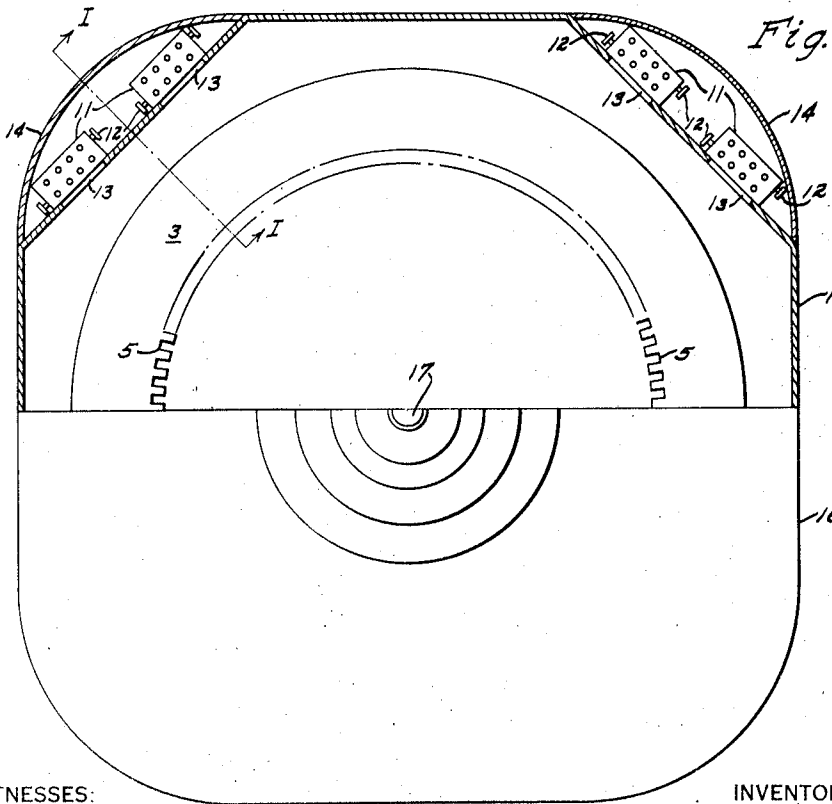


Fig. 2.

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2,228,105

VERTICAL GENERATOR

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Application April 21, 1938, Serial No. 203,322

3 Claims. (Cl. 171-252)

The present invention relates to the construction of vertical dynamo-electric machines, and, more particularly, to an arrangement of coolers for the ventilating air in large vertical water

5 wheel generators.

Generators designed to be driven by water wheels normally rotate at relatively low speeds and, in order to generate currents of the frequencies usually used, it is necessary to provide a large number of poles on the rotating field members of such generators. This requires a rotor of large size and the overall diameter of the machine is, therefore, also quite large. In the conventional design of such machines, the stator frame is usually circular and a number of generators are arranged in a single row in the power house. The width of the power house, therefore, is determined by the diameter of the machines and its length is determined by the spacing between center lines of the machines, which is also dependent upon their diameter.

The usual method of ventilation of water wheel generators is by means of air, and the heated air discharged from the machine is passed through coolers and recirculated through the machine. These coolers are usually placed on the exterior of the stator frame and the total space occupied by the generator is, therefore, increased by the size of the coolers. This increases the required dimensions of the power house over what would be necessary to accommodate the machines alone.

The object of the present invention is to provide a vertical generator which will occupy a minimum amount of space.

35 A more specific object is to provide a generator construction and arrangement of coolers therefor which will be very compact and will occupy no more space than would be required by the generator alone.

40 These objects are attained by using an octagonal stator frame, the width of which across opposite flat sides is equal to the diameter of the conventional circular frame of a machine of equal capacity. The coolers are placed on alternate exterior surfaces of the frame and are enclosed in housings, the surfaces of which lie approximately in the planes of the adjacent surfaces of the frame, thus providing a machine which is generally square in external appearance and whose width, including the coolers, is equal to the diameter of a conventional machine without the coolers. This provides a very compact arrangement, which results in a substantial saving in space and makes possible a smaller and, therefore, cheaper power house.

The invention will be more fully understood from the following detailed description taken in connection with the accompanying drawing, in which:

Figure 1 is a side elevation of a vertical generator, partly in section on line I—I of Fig. 2; and

Figure 2 is a plan view of the generator, partly in horizontal section, with the rotor omitted.

The generator shown in the drawing, for purposes of illustration, has an octagonal outer frame member 1, preferably made of sheet steel or some similar material, the width of which across opposite flat sides is equal to the diameter of a machine of conventional design of equal capacity. A plurality of web members or flanges 2 are positioned on the interior of the frame and are welded or otherwise secured to it. It will be seen from Fig. 2 that the outer periphery of these flanges conforms to the shape of the frame 1 while the inner periphery is circular. The stator core 3 is of laminated construction having radial air ducts 4 and is secured to the flanges 2 in any desired manner. Slots 5 are formed in the stator core for the reception of armature windings of any suitable type. A rotor member of any desired or usual construction, preferably having salient poles, is secured to a shaft 6 which is provided with a flange 7 at its lower end for connection to a water wheel or other prime mover. The machine is closed at the bottom by a suitable end bell 8 and is supported on sole plates 9 on a foundation 10.

For the purpose of cooling the air or other gaseous medium used for ventilation of the machine, a plurality of coolers 11 is provided. These coolers are preferably of the water tube type and each comprises a plurality of vertical tubes through which water is circulated to cool the air passing over them. Connections 12 are located at the lower ends of the coolers for the entrance and discharge of water. As shown in Fig. 2, the coolers are arranged in pairs and secured to alternate external surfaces of the generator frame 1 over openings 13 which are provided in these surfaces to permit the air to escape from the machine. The coolers are enclosed in housings 14 formed of sheet steel or other suitable material and, as shown in Fig. 2, these housings have external surfaces which are preferably curved and which lie entirely within the triangular space defined by the planes of the adjacent surfaces of the frame so that no part of the housing extends beyond the lateral dimensions of the octagonal frame. The air passing

into the housings is directed by them to the upper end of the machine where it passes through openings 15 back into the interior of the generator.

5 The operation will be apparent from the above description. The air passing into the machine is circulated through it by the fan action of the rotor, which may be increased, if desired, by the use of fan blades on the rotor in the well-known
10 manner. The air passes through the radial ducts 4 of the stator core and escapes through the openings 13 from which it passes through the coolers 11 and into the housings 14, where it is directed longitudinally to the end of the machine and re-enters it through the openings 15.
15 It should be understood that although the openings 15 have been shown at the upper end of the machine, they might equally well be placed at the lower end, or provided at both top and
20 bottom.

The upper end of the machine is closed by a cover member 16 of sheet steel which is of generally square outline with rounded corners so as to extend over the housings 14 to close their
25 upper ends. If desired, an exciter or other auxiliary generator 17 may be supported on the cover 16 and driven from the shaft 6.

It will be seen that by using an octagonal frame structure and enclosing the coolers in the housings 14, a machine is provided which is generally square in external appearance, having the coolers concealed in the corners of the square. The lateral dimensions of the square are equal to the diameter of the circular frame of a machine
30 of conventional construction, but since the coolers are included within these dimensions, no additional space is required for them and the total space occupied by the machine is, therefore, considerably less than that occupied by a generator
35 of conventional design. A power house in which a number of these machines are to be placed will, therefore, be materially smaller and cheaper.

It will be seen, therefore, that a very compact construction for a vertical generator has been
40 provided which materially reduces the overall space occupied by the machine but with no sacrifice of cooling efficiency, since the effectiveness of the coolers is as great, or greater, than in conventional designs.

50 Although a specific embodiment of the inven-

tion has been illustrated and described, it is to be understood that it is not limited to the specific details of construction shown, but that, in its broadest aspect, it includes all equivalent embodiments and modifications which come within
5 the scope of the appended claims.

We claim as our invention:

1. In a vertical dynamo-electric machine, a stator member comprising a stator core and an octagonal frame member supporting the stator
10 core, said frame having openings in alternate flat surfaces to permit the escape of ventilating air, a plurality of coolers secured to said surfaces over the openings and extending axially of the machine, and housings enclosing the coolers and communicating with the interior of the frame at an end thereof, said housings having rounded external surfaces which lie within the space defined by the planes of the adjacent surfaces of the frame.
15 20

2. In a vertical dynamo-electric machine, a stator member, an octagonal frame structure in which the stator member is supported, housings secured to alternate external surfaces of said frame structure, said housings lying entirely
25 within the spaces defined by the planes of the adjacent surfaces of the frame, the frame surfaces to which the housings are secured having openings therein to permit air to flow from the machine into the enclosures formed by the housings and from said enclosures back into the machine, and coolers disposed in said enclosures for cooling the air flowing through them.
30

3. In a vertical dynamo-electric machine, a stator member, an octagonal frame structure in which the stator member is supported, housings secured to alternate external surfaces of said frame structure, said housings lying entirely within the spaces defined by the planes of the adjacent surfaces of the frame, the frame surfaces to which the housings are secured having openings therein to permit air to flow from the machine into the enclosures formed by the housings and from said enclosures back into the machine, and coolers secured to the external surfaces of the frame within said enclosures and over certain of said openings.
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