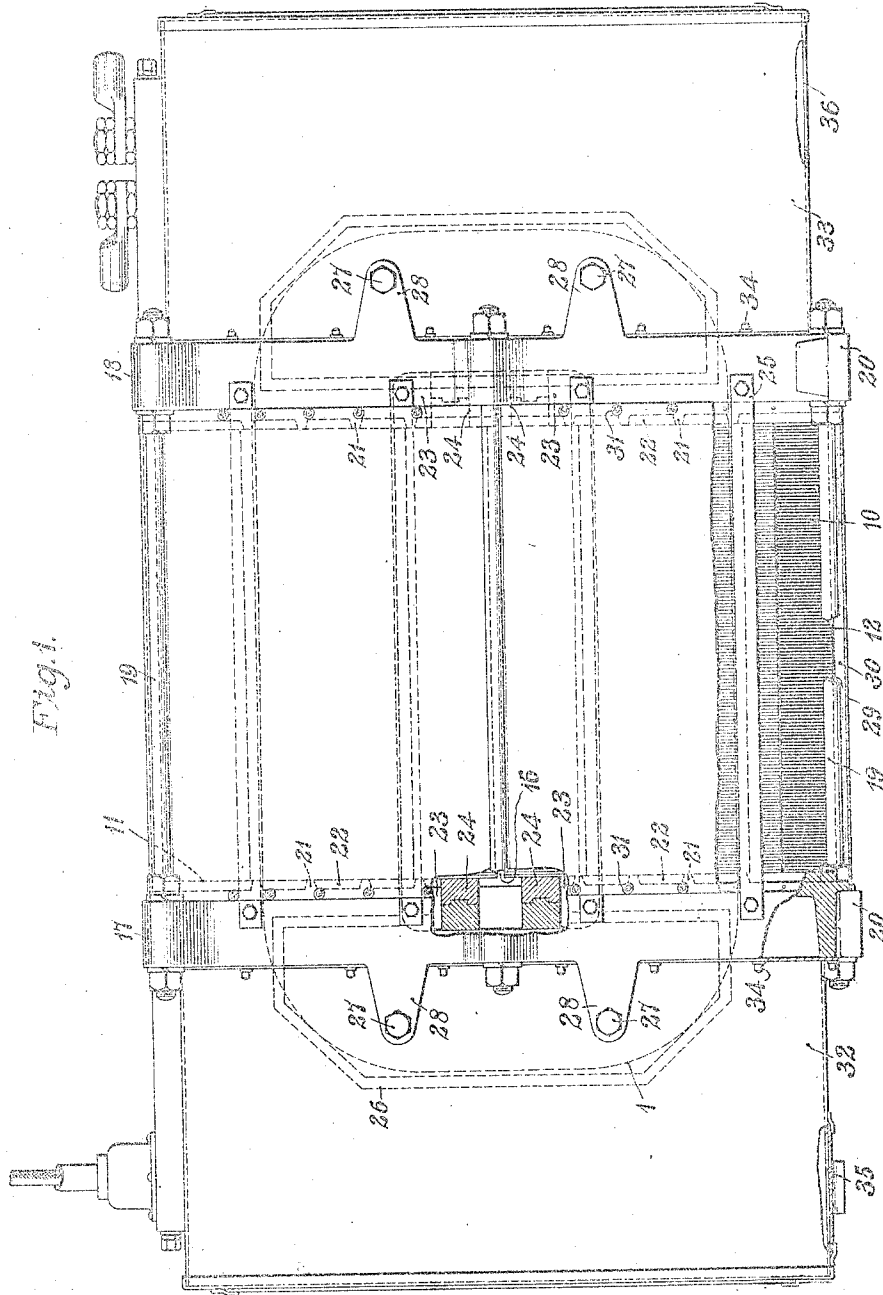


S. E. JOHANNESSEN.
TRANSFORMER.
APPLICATION FILED MAR. 3, 1906.

Patented Aug. 5, 1913.
2 SHEETS-SHEET 1.

1,069,259.



WITNESSES:

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TRANSFORMER.

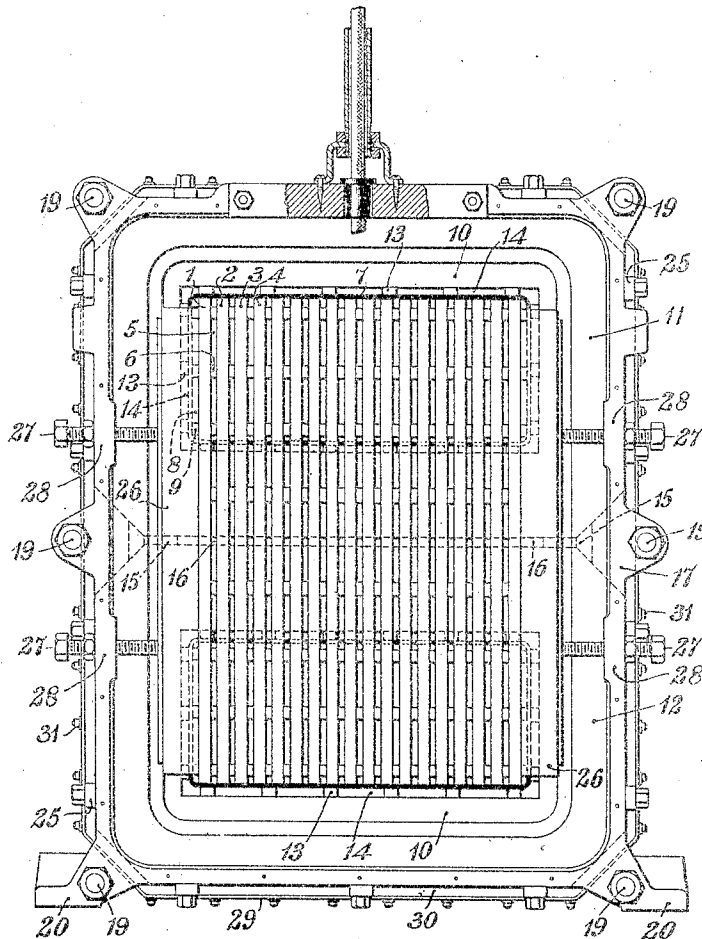
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2 SHEETS—SHEET 2.

Fig. 2.



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TRANSFORMER.

1,069,259.

Specification of Letters Patent.

Patented Aug. 5, 1913.

Application filed March 3, 1906. Serial No. 304,113.

To all whom it may concern:

Be it known that I, SVEND E. JOHANNESSEN, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Transformers, of which the following is a specification.

My invention relates to electrical transformers and particularly to those which are provided with ventilating passages and which are adapted to be cooled by drafts of air.

The object of my invention is to provide a novel and improved structure for transformers of the character indicated.

As usually constructed, transformers that are adapted to be cooled by the forced circulation of air are of the shell type and comprise a plurality of coils separated by ventilating spaces, and a laminated, magnetizable core in which transverse ventilating spaces are provided at intervals, air being forced through the passages between the coils and through and around the core structure. When such transformers are placed upon locomotives or other vehicles it is extremely desirable that the dimensions and weights be made as small as is consistent with successful operation, and I have, therefore, so constructed and arranged the parts of a transformer as to enable very material reductions in these respects over others that have heretofore been provided. I propose to eliminate the transverse ventilating ducts that are usually provided at intervals in the core structure and instead thereof, to provide passages between the coils and the core and also between the rectangular sections of the core, as well as between the core and the inclosing casing. By means of this arrangement, ventilating passages are provided adjacent to all of the surfaces of the core and the usual transverse core ducts may be omitted.

Figure 1 of the accompanying drawings is a view in side elevation of a transformer constructed in accordance with my invention, certain of the parts being broken away for the sake of clearness of illustration, and Fig. 2 is a plan view of one end of the transformer shown in Fig. 1.

The straight side portions of a plurality of coils 1, 2, 3, 4, etc., between which ventilating ducts 5 are provided by means of

spacing strips 6, are inclosed by insulating casings 7 between which and the coils ventilating ducts 8 are provided by spacing strips 9. A laminated, magnetizable core 10, comprising two rectangular sections 11 and 12, also surrounds the straight side portions of the coils, and spacing strips 13 are interposed between the casings 7 and the core in order to form ducts 14 adjacent to the core. The sections 11 and 12 of the core are also separated a short distance by means of strips 15 for the purpose of forming a passage 16 between them.

The core is clamped between two end frames 17 and 18 by means of bolts 19, the frames being provided with lugs or feet whereby the transformer may be supported or suspended. They are further provided with ribs 21 on their inner faces whereby ducts 22 are formed between the core and the frames. Ducts 23 are also formed between the inner ends of the coils and the adjacent end faces of the core rectangles by means of drift wedges 24. The core punchings are prevented from becoming displaced by means of bars 25 that are secured at opposite ends to the frames 17 and 18. The ends of the coils are clamped between boards or plates 26 by means of bolts 27 that are screw-threaded in arms 28 that project from the frames 17 and 18.

A sheathing 29 surrounds the laminated core between the frames 17 and 18 so as to leave passages 30 adjacent to the outer surfaces of the core, the sheathing being secured to the frames along its edges by means of screws 31. The portions of the coils that project from the core are inclosed by hoods 32 and 33 that are also secured to the frames 17 and 18, respectively, by means of screws 34, the hoods being provided with openings at 35 and 36 through which air for ventilating the transformer may be forced and expelled, respectively.

In the operation of the transformer, air is forced through the opening 35 into the hood 32 and a portion of it passes through the transformer by way of the passages that are provided between the coils by means of the spacing strips 6. The air is also forced through the ducts 22 between the frame 17 and the end of the magnetizable core, through the passages 30 over the outer surfaces of the core, through the passages 14 over the inner surfaces of the core and

through the passages 16, between the rectangles, into the hood 33 from whence it is discharged into the atmosphere. Thus it is seen that drafts of air pass over substantially the entire external surface of the core structure which, to my knowledge, has not heretofore been effected.

When a transformer is constructed as just described it is unnecessary to provide transverse ventilating ducts at intervals in the core structure, and consequently the length of the core may be materially less than would otherwise be the case and the lengths of the coils may be likewise reduced. Thus the dimensions and weight of the transformer may be materially less than those of transformers heretofore used.

I claim as my invention:

1. A transformer comprising a magnetizable core, a plurality of magnetizing coils, frames between which the core is clamped, said frames having auxiliary means for supporting the coils, and a casing surrounding the coils and the core and having ventilating passages between the casing and the core.

2. In a transformer, the combination with a plurality of magnetizing coils and a magnetizable core, of frames between which the core is clamped, and means whereby ventilating passages are provided between the frames and the core.

3. In a transformer, the combination with

a plurality of magnetizing coils and a magnetizable core, of frames between which the core is clamped, and means whereby ventilating passages are provided between the core and the coils and between the frames and the core.

4. In a transformer, the combination with a plurality of magnetizing coils and a magnetizable core, of frames for supporting the core, and means whereby ventilating passages are provided between the coils, between the core and the coils and between the frames and the core.

5. In an air blast transformer, two laminated cores separated by a vertical air space, primary and secondary coils surrounding the adjacent portions of said cores and having ventilating air passageways, and a casing surrounding the transformer, said casing having air inlet and air outlet openings, the parts being so constructed and arranged that air can be forced upward between the coils, through the space separating the cores, between the core and coils and between the core and the casing.

In testimony whereof, I have hereunto subscribed my name this 28th day of February, 1906.

SVEND E. JOHANNESSEN.

Witnesses:

OTTO S. SCHAFER,
BIRNEY HINES.