March 18, 1941. A. G. DEAN 2,235,205

DOUBLE END TRAIN

Filed May 8, 1937 2 Sheets-Sheet 1

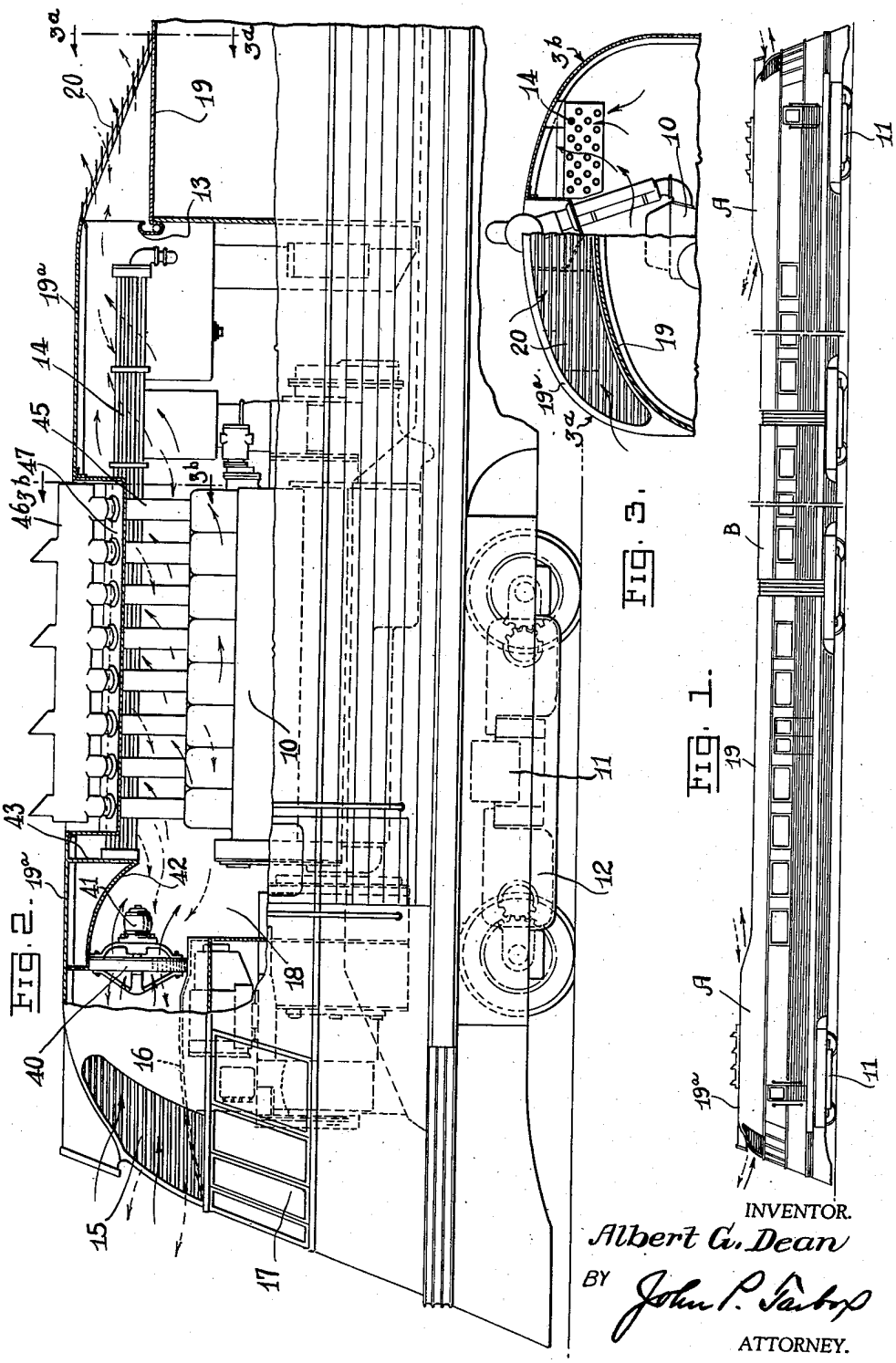

FIG. 2.

FIG. 3.

FIG. 1.

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Filed May 8, 1937 2 Sheets-Sheet 2

Fig. 4.

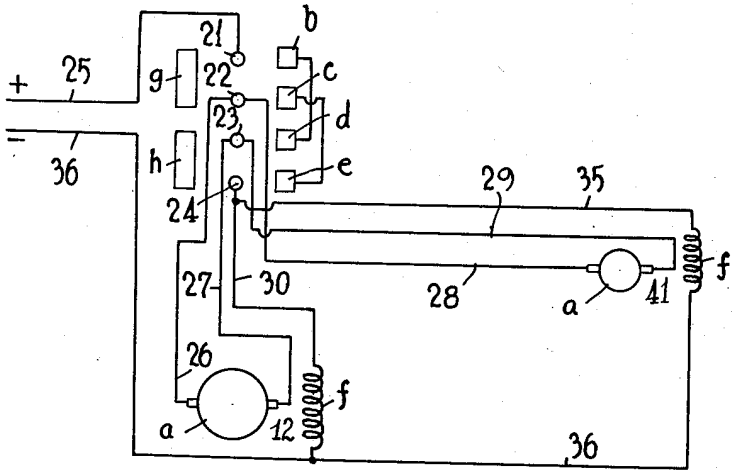
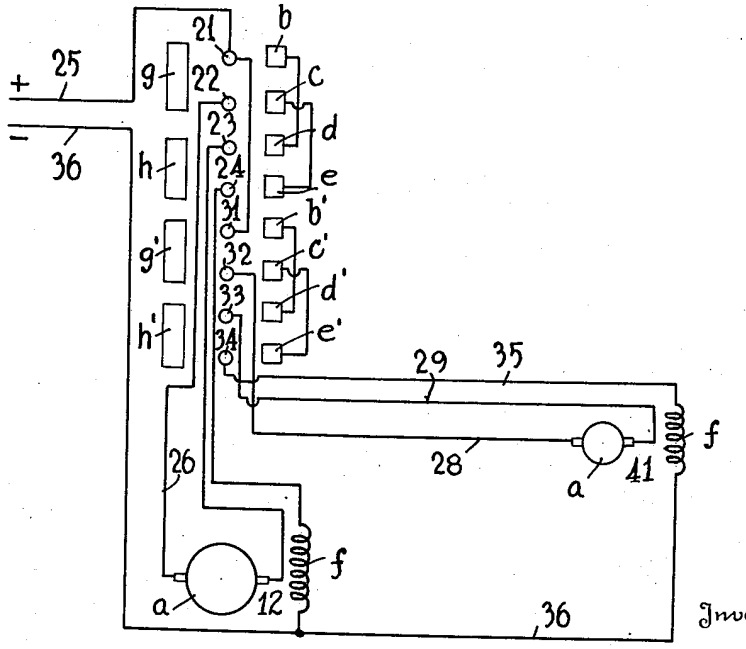


Fig. 5.



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2,235,205

UNITED STATES PATENT OFFICE

2,235,205

DOUBLE END TRAIN

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2 Claims. (Cl. 105—62)

This invention relates to improvements in vehicle ventilating means and more particularly to a reversible cooling arrangement for the power unit of a rail car.

In order to avoid the necessity for turning trains around at a terminal, it has been proposed that the train be provided with power and operating units at the respective ends of the train so that it can be operated in either direction. With such a construction, it is necessary to cool the power units, regardless of the direction of operation and with each unit being cooled with the normal high efficiency of cooling of the usual head end unit. This is necessary whether one power unit is provided and the train is being operated in turn as a pusher and then as a tractor or whether the train is double ended, for in each case, the frontal area of the power unit through which the air is directed in one direction is not exposed to the direct air flow in the other direction.

The principal object of the present invention is to provide an improved arrangement for ventilating and cooling the power unit of a two-directional tractor unit and more particularly the heat dissipating part thereof regardless of the train direction and with substantially equal efficiency in both directions.

A more particular object of the invention is to provide a streamline power unit for a train in which a heat dissipating unit is so mounted within the body of the power unit that it may be cooled efficiently by air passing through the body in the direction of travel supplemented by a Venturi effect.

Further objects and advantages of the invention will appear from the following disclosure of a preferred form of embodiment thereof taken in connection with the attached drawings, in which,

Fig. 1 is a side elevation on a reduced scale showing a train made up in accordance with my invention;

Fig. 2 is a fragmentary side elevation of the power unit part of a train;

Figure 3 is a transverse sectional view, the section being taken in two different planes represented in Fig. 2 by the section lines 3*a*—3*a* and 3*b*—3*b*, the left-hand portion of the figure designated by reference character 3*a* showing the parts as they appear in a section along the line 3*a*—3*a* and the right-hand portion designated by reference character 3*b* as they appear in a section along line 3*b*—3*b*, looking in the direction of the arrows at the ends of the section lines.

Figs. 4 and 5 are electrical diagrams showing alternative electric control circuits.

In accordance with one form of embodiment of my invention, the double ended train, shown in Fig. 1, is provided with end cars A and may be provided with one or more intermediate cars B. Each car A is provided with an operator's compartment for double ended train operation and each end car A is preferably provided with a power plant 10, one form of which is shown in Fig. 2. It is to be understood that with a power plant, whether of the direct drive internal combustion type or of the electric drive type or whether of the steam type, there is usually some form of heat dissipating unit which is necessarily cooled under normal operating conditions. In an internal combustion engine type power plant, this is normally called a radiator and its counterpart in a steam power plant is a condenser. With an electric unit, the transformer is usually provided with equivalent cooling means.

Although it is common to provide a separate power plant at each end of the train, this is not essential when the end trucks 11 are operated electrically as by the electric motors 12, generally shown in Fig. 2. It would be sufficient to have one source of power and dual controllers so that the power plant might be confined to one end of the train. Regardless of the number of power plants, however, and regardless of the specific nature of them, the train must have efficient cooling of the power plant, especially the heat dissipating unit, generally indicated at 14 in Fig. 2, and regardless of the direction of movement of the train.

When the train is moving in a forward direction, and assuming the forward movement to be one toward the left, as shown in Fig. 2, the air for cooling the power plant 10 and the heat dissipating unit 14 flows into the body through the frontal opening having the grille 15 and then passes over the ceiling 16 of the operator's compartment 17 and thence into the engine compartment. It then circulates around the power plant 10 and the heat dissipating unit 14, it being understood that it is desirable to ventilate the power plant compartment as well as cool the radiator 14.

In accordance with my invention, I provide an opening between the normal roof elevation 19 and the super-elevated roof portion 19*a* having a substantial projected area at right angles to the direction of motion, which opening is provided with a suitable grille 20 and is of substantially the same area as the front opening 15. The air discharges from the engine compartment 18 through this exhaust opening to the atmosphere. The air path in this assumed forward movement of the train is shown by the full line arrows.

Not only is there a substantial flow of air due to the direct force exerted on the frontal area of the train, but also, a Venturi or suction effect

is set up by the air passing over the body of the power unit, the roof of which is streamlined to offer low resistance to air flow. This suction on the exhaust opening 20 materially aids the flow of air through the engine compartment.

If the direction of the train is reversed, the cooling of the heat dissipating unit 14 is but a reverse flow of air and in this case, the air enters the grille opening 20, as shown by the arrows in dotted lines, such air then passing over the power plant and out through the grille opening 15 which is now the receding end of the train. The streamline shape of the tractor unit body is such that the Venturi effect is substantial in this direction also with the result that the air cooling of the radiator is substantially of equal efficiency regardless of the direction of the train.

It is of course to be understood that with a double ended train having two power plants, the cooling of one is by an air flow reversed as compared to the other and it is therefore essential that the cooling be of high efficiency regardless of the train direction. To prevent rain water from washing into the engine compartment 18, a rain catcher 13 is provided adjacent the grille opening 20 and suitably connected with a conduit to carry off the surface water.

As shown in Fig. 3, the grille opening 20 is of very substantial extent inasmuch as there is a large area between the normal roof line and the elevated roof over the engine compartment and, as shown in Fig. 1, the elevated portion 19a extends only throughout a small part of the total length of the train so that there is a substantially continuous flow of air across the grille opening 20 which in one direction withdraws the air from the engine compartment and in the other case, tends to blow air across the heat dissipating unit 14.

If desired, a fan 40 may be provided for assisting in the air flow, such fan being of especial value at low speeds. As shown in Fig. 2, the fan is generally indicated at 40 and may be operated by any suitable form of drive, such as the fan motor 41, although in the absence of electric power, it may be operated by mechanical drive through a suitable clutch as the rotation of the fan should be reversed in accordance with the different direction of the train. A suitable deflector 42 and baffle 43 are provided adjacent the fan to assure a substantially complete flow of air across the heat dissipating unit 14. It is to be noted that in this construction, the elevated roof 19a is substantially closed against the discharge of air and with an internal combustion type of power plant, the exhaust is through suitable pipes 45 into a muffler 46 with the pipes passing through a tray 47.

With a full electric control of the power trucks 11 and of the fan 41, simultaneous reversal of the fan with changes in the direction of the train can be accomplished by suitable electric controllers of a well known type which are diagrammatically illustrated in Figs. 4 and 5. The single form of reversing switch of the controller type shown in Fig. 4 has a series of four fixed contacts of which 21 is connected to the power line 25. Contact 22 is connected through wire 26 to the armature of the traction motor 12 and through wire 28 to the armature of fan motor 41. Contact 23 is also connected to the armature of motor 12 through wire 27 and through wire 29 to the armature of fan motor 41. Contact 24 is connected by wires 30 and 35 to the field windings of both motors 12 and 41. A common return wire 36 is connected to both fields so that the motors are connected in parallel.

Two sets of movable contacts cooperate with the fixed contacts, contacts *b* and *d* being connected and contacts *c* and *e* being connected. It will thus be seen that with the controller in one position, contacts 21 and 22 are bridged by contact *g* and simultaneously, contacts 23 and 24 are bridged by contact *h*. This may be considered a forward direction with both motors operating in the same effective direction.

In the second position, however, contacts *b* and *d* serve to interconnect contacts 21 and 23 and contacts *c* and *e* serve to interconnect contacts 22 and 24. The direction of the current through the two armatures is thus reversed so that the motors then operate in an effective reverse direction.

In Fig. 5, each motor is provided with separate contacts mounted on a common form of drum controller for independent connection with a source of power. In addition to the set of contacts shown in Fig. 4, a second set of contacts 31, 32, 33 and 34 are provided for the fan motor 41. Two additional sets of movable contacts *b'*, *c'*, *d'*, *e'* and *g'*, *h'* cooperate therewith. The contacts 21 and 31 are connected for a simultaneous supply of current to both motors with the result that both motors will be simultaneously controlled to operate in the same effective direction.

While I have shown a preferred form of embodiment of my invention, I am aware that other modifications may be made thereto and I, therefore, desire a broad interpretation of my invention within the scope and spirit of the disclosure herein and of the claims appended hereinafter.

What I claim is:

1. In a train of the class described having a power plant at one end thereof, a body enclosing said power plant and including a roof over said power plant, the frontal area of the body below said roof having an opening therein, said roof in rear of said frontal area of the body having an opening therein vertically between its top portion and a lower roof portion which extends rearwardly of said top portion, said openings having communication with the body interior and being of a size and relative location in the air stream to act with substantially equal efficiency as air intake or air outlet, depending upon the direction of travel of the train.

2. In a train of the class described having at at least one end thereof a vehicle body including a roof thereover, the frontal area of the body below the roof having an opening therein, said roof rearwardly of said frontal area having an opening therein vertically between its top portion and a lower roof portion which extends rearwardly of said top portion, said openings having communication with the body interior and being of a size and relative location in the air stream to act with substantially equal efficiency as air intake or air outlet, depending upon the direction of travel of the train.

ALBERT G. DEAN.