United States Patent

Cederbaum

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[54] NOISELESS SOFT-RUNNING POWER PLANT

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[52] **U.S. Cl.** .....**181/33 K**, 181/50, 181/53

[51] **Int. Cl.**.....**F02f 7/00**, F01n 1/10

[58] **Field of Search**.....181/33, 33.4, 50, 35, 35.2, 181/53, 33.22, 33.223

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[57] **ABSTRACT**

In a soft-running power plant with a power unit enclosed by a casing forming a sound-absorbing chamber with walls having an outlet for consumed air and an inlet for cooling air and combustion air as well as a number of labyrinth forming passages, there are so arranged that the cooling air is caused to travel along the power unit and is passed through a labyrinth passage in the wall opposite the inlet, thus forming an outlet for heated air.

2 Claims, 3 Drawing Figures

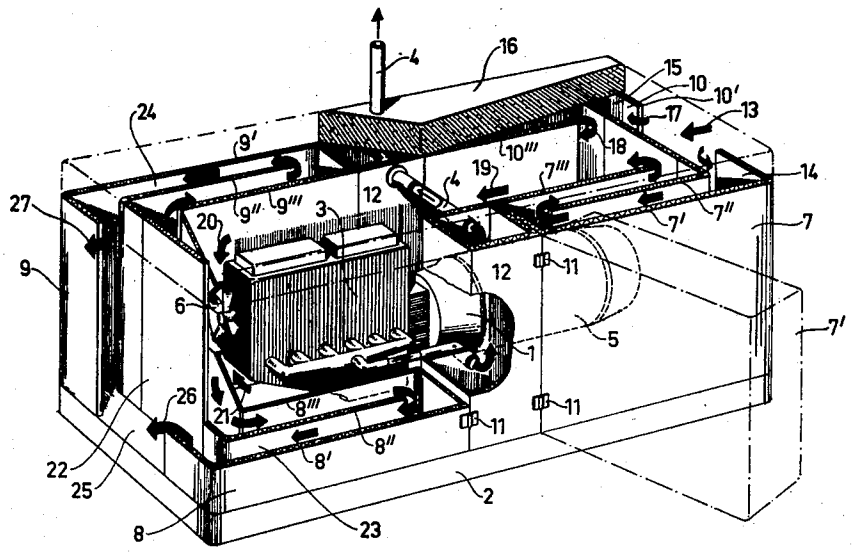
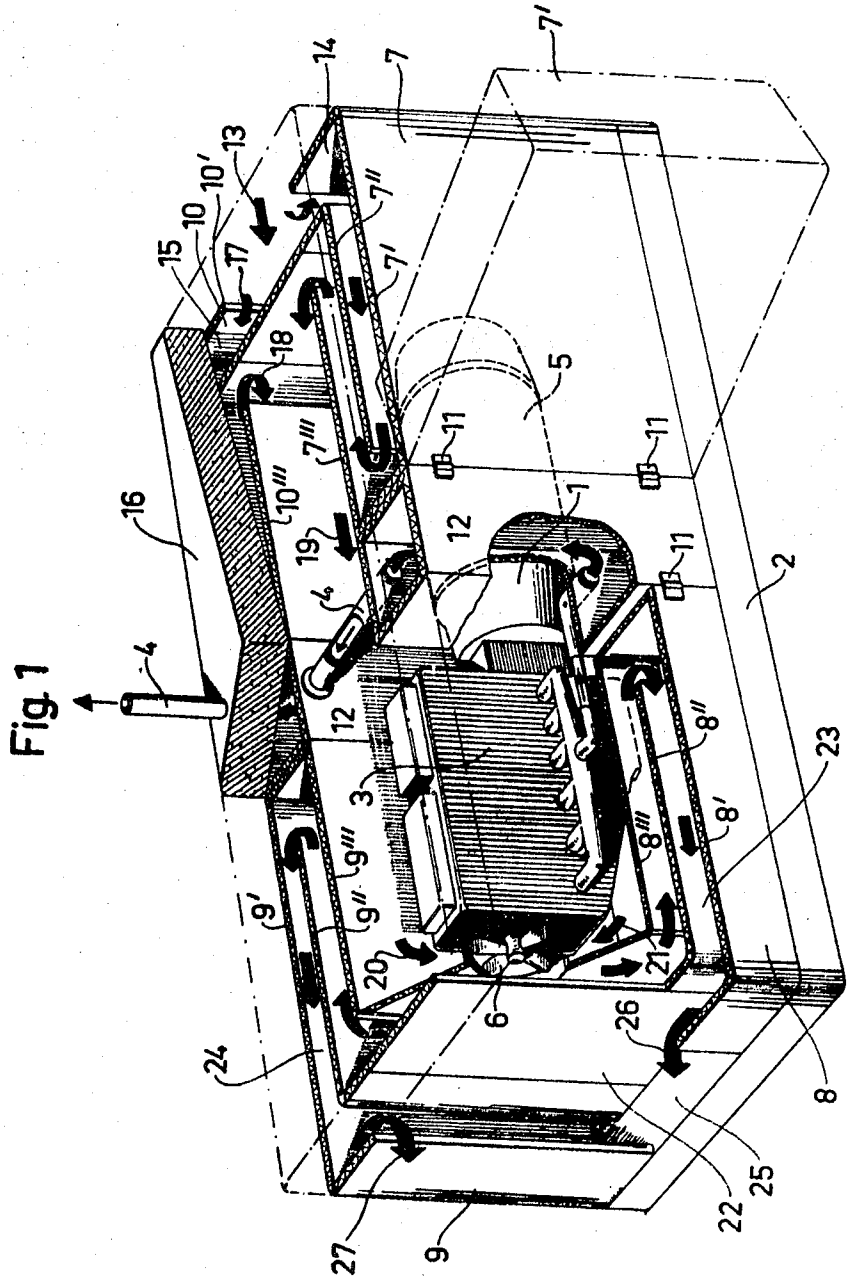


Fig. 1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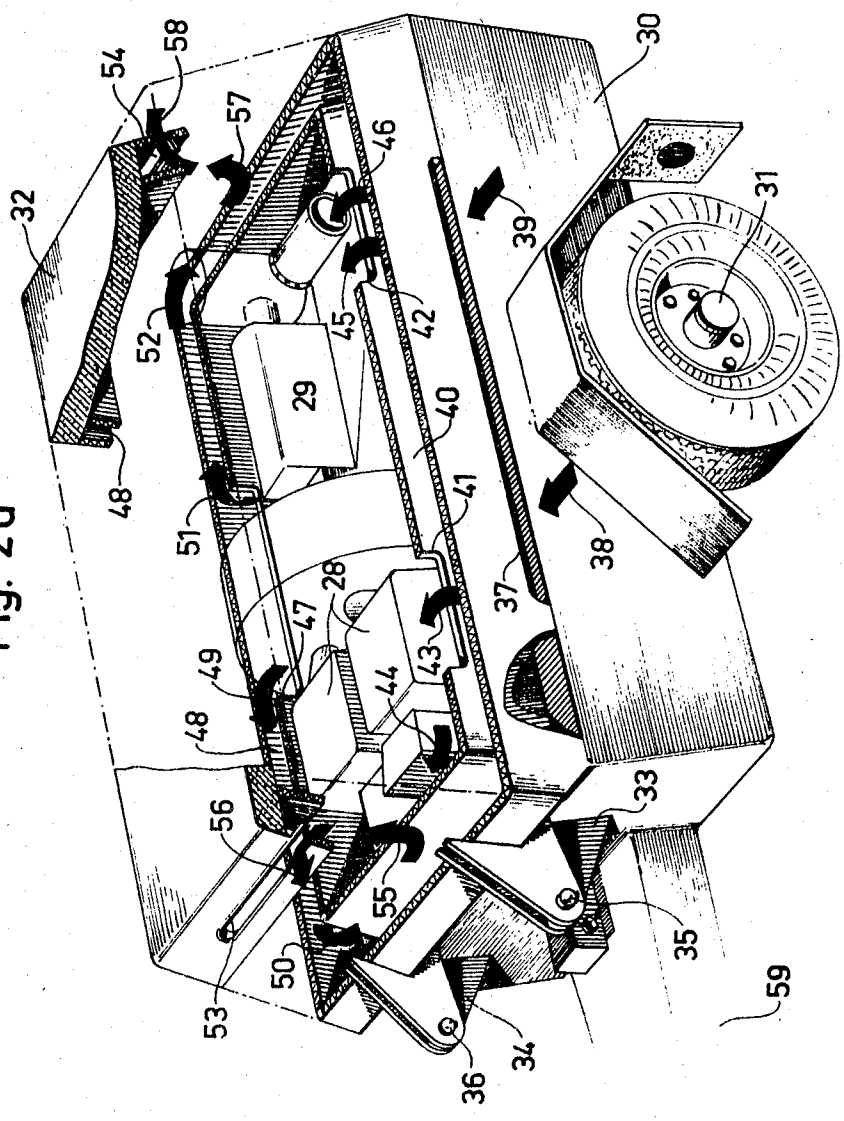
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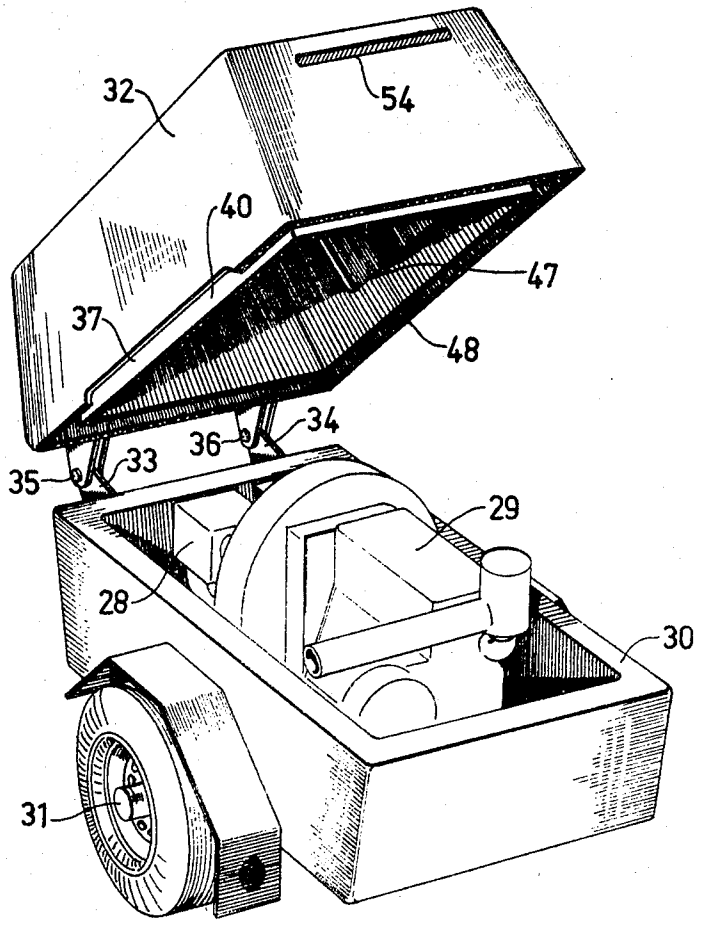
Fig. 2a

Fig. 2b



NOISELESS SOFT-RUNNING POWER PLANT

Electric units which are enclosed in casings adapted to form a sound-absorbing chamber or a sound suppressor for the unit are known to the art, the walls of the chamber at the same time forming at least one outlet for consumed air (exhaust gases, cooling air, etc.) and possibly also an air inlet for cooling air and for combustion air for the units. The casing is formed by two walls, an inner and an outer, arranged to provide a number of labyrinth-forming passages for the outgoing sound waves, which are to lose their sound effect as a result of the numerous changes in direction experienced in the labyrinth. The passage or passages forming the labyrinth are also arranged to enclose the power unit on two or more sides thereof.

The sound level obtained with a unit of above type is so low that the sound range is only a quarter or a fifth of that experienced with sound dampened power units constructed according to the wall insulation principle. Thus, a person of average hearing will hardly hear the first-mentioned unit at a distance of more than about 35 meters, whereas the power unit employing wall insulation methods can be heard at a distance of about 200 meters.

The present invention is concerned with an improved power unit of the first-mentioned type, whereby such a unit can be made readily accessible for supervising and servicing purposes and whereby still greater power can be taken out of the machine without causing unpermitted increases in temperature or sound level.

The present invention is mainly characterized in that the labyrinth-forming passage or passages for the cold air intake and for the combustion air intake of the power unit are so arranged in relation to the power unit that cold cooling air taken in through the labyrinth passage forming the air intake is forced to pass along and in contact with the unit, suitably in its longitudinal direction. Furthermore, cold cooling air is passed out through a labyrinth passage forming an outlet for the hot wire and arranged in the opposing wall. The labyrinth passage which forms the inlet is suitably arranged at one end of the space occupied by the unit. The labyrinth passage which forms the outlet and a suction fan cooperating with the intake of said passage and an optional engine cooling means are arranged at the opposite end of said space. In one embodiment of the invention the labyrinth is formed by wall elements which may be withdrawn or inserted either up or down or laterally and by flaps or cover means. The wall elements, flaps and cover means may be mounted on vertical or horizontal shafts.

The invention will now be described in detail, with reference to the accompanying drawings, in which

FIG. 1 is a perspective view of one embodiment of the invention, and

FIGS. 2*a* and 2*b* are two perspective views of another embodiment of the invention.

The embodiment shown in FIG. 1 comprises a soft-running or "noiseless" power plant in the form of an electric power plant 1 supported in a framework or on a base 2 and enclosed in a sound insulating casing. The power plant consists of an internal combustion engine 3 having an air intake and an exhaust pipe 4. In the illustrative example the power unit is assumed to be water cooled, although air is passed by means of a fan 6 through a radiator (not shown) at the left-hand wall of the sound-insulating casing, as seen in the drawing. The internal combustion engine member 3 drives a generator 5. The sound absorbing casing enclosing the unit is formed of four wall elements 7, 8, 9 and 10 which form labyrinth passages and which are vertically suspended at their outer edges by hinges 11 from a U-shaped tubular beam of rectangular cross section, of which only the two limb members can be seen in FIG. 1. Each of the four wall elements 7–10 comprises three single wall members 7′, 7″ and 7‴; 8′, 8″ and 8‴ ; 9′, 9″ and 9‴; and 10′, 10″ and 10‴ respectively, constructively built together one inside the other. In this way each of the four wall elements can be swung out, as shown by the dashed lines in FIG. 1 in the case of member 7′. This renders the wall members easily accessible for inspection purposes, as well as affording access to the power unit for supervision and servicing. Each wall member forms a labyrinth passage, which comprises an integral part of a passage system through which the necessary cooling air and air of combustion is passed to the power unit 1 and through which the heated cooling air is lead away. The passage of the air through the system is shown in FIG. 1 by arrow 13. At this point the inlet passage is divided into a passage 14, the direction of flow being marked by four arrows, and a passage 15, which is partially hidden by the sectional view of a cover plate 16. The flow direction in passage 15 is shown by arrows 17 and 18. Thus, the air enters at 13, branches into the two passages 14 and 15 and enters the engine chamber where it travels along the unit 1 in the direction of arrow 19. As indicated by arrows 20, 21, the flow of air is maintained by the fan 6, which passes the cooling air, now heated by the engine, through the radiator behind end wall 22 of the casing. At this point the air is once again divided, part of said air flowing through the passage 23 and part through passage 24, as shown by the arrows. The heated cooling air leaves as shown by arrows 26 and 27 via the outlet 25, which is sealed against the unit space.

As will be evident from FIG. 1, a sound wave propagated through any of passages 14, 15, 23 or 24 is forced to undertake five to six changes in direction, and is thereby appreciably dampened.

Similarly to other arrangements of this nature, the unit according to the invention may be mounted on the chassis of a vehicle.

In the embodiment shown in FIGS. 2*a* and 2*b* the power unit comprises a compressor 28 which is driven by an internal combustion engine 29. The power unit is positioned in a sound-insulating tray 30, which in turn is mounted on two wheels 31. In this embodiment, the air inlet and outlet sound-insulating labyrinth forming passages are arranged in the lid of tray 30, in the form of a cover member 32. The cover member 32 can be swung back to the position shown in FIG. 2*b* on bearings 35, 36 arranged in brackets 33, 34 positioned outside one side edge of said cover. The cover can either by swung back by means of a jack (not shown) or by means of some suitable pneumatic arrangement.

The construction of cover member 32 and the arrangement of the air passages in the wall elements of said cover can best be seen from FIG. 2*a*, in which the cover member is shown in section. The unit intake for cooling air and air for combustion is in the form of a recess 37 which forms a gap when the cover 32 is closed and through which air enters, as indicated by arrows 38 and 39. The air thus enters passage 40 and is divided through openings 41 and 42 in the inner wall member of the cover member into a stream of air, indicated by arrow 43, for cooling the compressor unit 28 and serving as intake air for the same. The air in passage 40 is divided into two further streams of air 45, for cooling the engine 29, and 46 for supplying for combustion to said engine. Arranged in inner wall member on the opposite side of the cover member is an opening 47, through which the heated cooling air exits the unit into a cover passage 48, where it is divided into one stream passing to the left in the direction of arrows 49 and 50 and one stream to the right in the direction of arrows 51 and 52 towards the end walls of the cover member 32. Arranged in each end wall are outlets 53 and 54 for the heated cooling air, as shown by arrows 55 and 56 and 57 and 58, respectively. As in the case of the embodiment of FIG. 1, the outlets 57 and 58 for the heated cooling air are sealed against the unit space.

As will be evident from FIGS. 2*a* and 2*b*, a sound wave propagated through passage 40 is subjected to two or three directional changes, while a similar wave propagated through passage 48 is subjected to three to four directional changes.

To enable the power unit to be towed behind a vehicle the tray 30 is provided with a tow bar 59.

Although the invention has been described with reference to the described and illustrated embodiments it can, however, be varied within the scope of the following claims.

What I claim is:

1. A soft-running power plant including a power unit enclosed by casing means for forming a sound-absorbing chamber for the power unit, said casing means comprising wall means wherein said wall means form:

a. inlet means for permitting air for cooling and combustion to enter said casing;

b. outlet means for permitting consumed air to exhaust from said casing;

c. labyrinth passage means for carrying sound waves generated by said power unit, said passage means changing directions a plurality of times, wherein said direction change is 180° in at least one of said plurality of direction changes, and thereby dissipating the energy in said sound waves;

d. said labyrinth passage means coupled to said inlet means whereby the air entering the casing through said inlet means passes through said labyrinth means in the longitudinal direction;

e. said labyrinth passage means coupled to said outlet means whereby the air exhausting from said casing through said outlet means passes through said labyrinth means; and

f. wherein a plurality of said wall means are rotatably mounted for rotating independent portions of said wall means about vertical shafts away from said power unit whereby easy access may be gained to said power unit.

2. The power plant of claim 1 wherein said passage means are sealed from the exterior of the power plant.

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