Nov. 18, 1969 E. C. HINCK III, ET AL 3,478,958

HOUSING FOR PORTABLE MACHINES

Filed Jan. 11, 1968 2 Sheets-Sheet 1

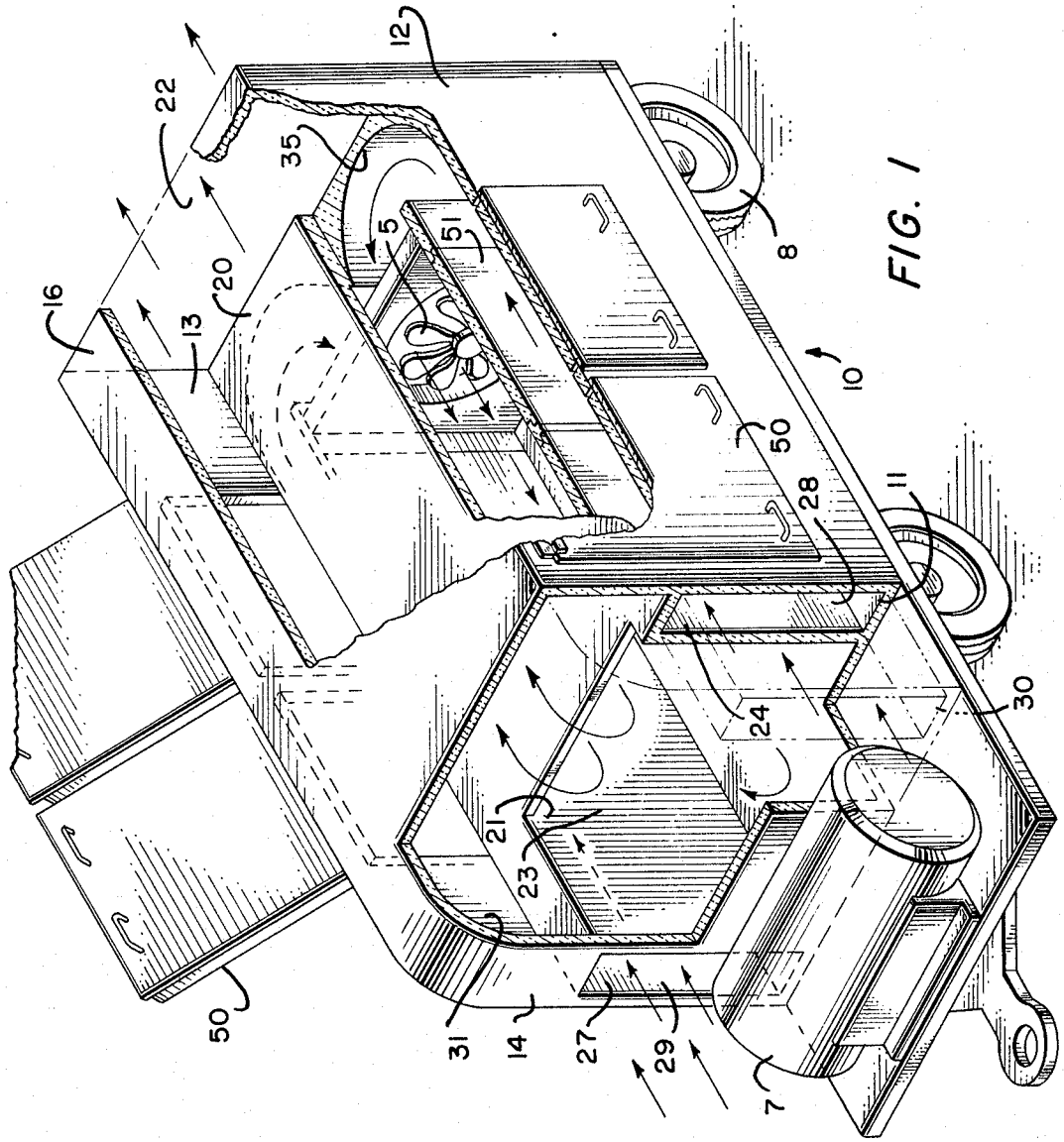

FIG. 1

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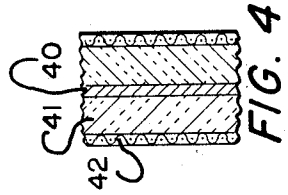

FIG. 4

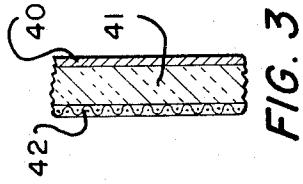

FIG. 3

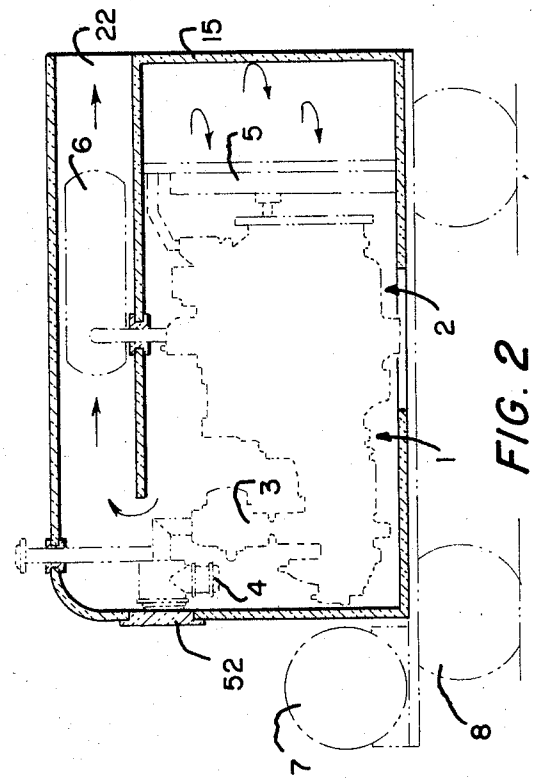

FIG. 2

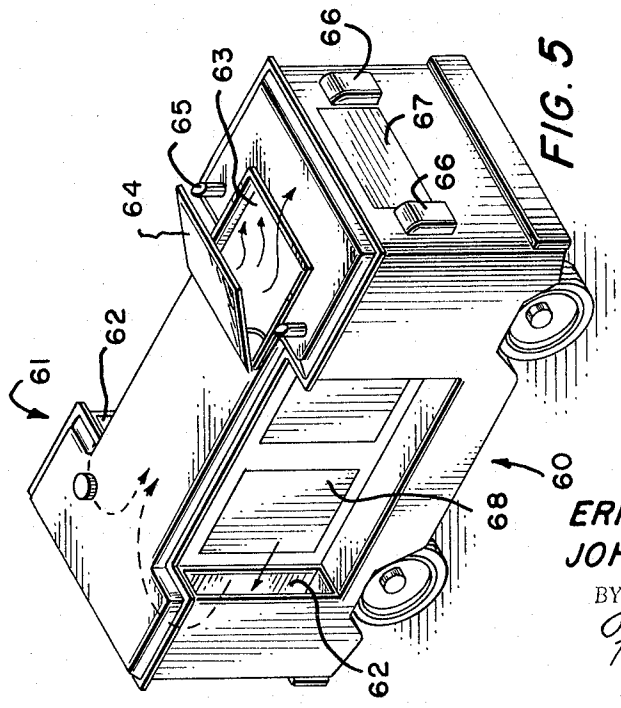

FIG. 5

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HOUSING FOR PORTABLE MACHINES

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Int. Cl. F04b 39/00
U.S. Cl. 230—232 10 Claims

ABSTRACT OF THE DISCLOSURE

A housing for a portable machine such as a compressor which is designed to muffle the noise produced by the machine. The housing includes a shell having a base, sidewalls, end walls and a top. A pair of ducts, parallel to the sidewalls conduct cooling air from outside the shell to the inside of the shell. A fan driven by the engine blows the air through a radiator system and through a chamber in which the compressor and compressor engine are housed. The cooling air then flows into a second or exhaust duct having its inlet at the opposite end of the shell from which it exits to the outside of the shell. Doors are provided in the housing to permit access to the machine. Each of the walls is covered with a sound absorbing material.

BACKGROUND OF THE INVENTION

This invention relates to housings for portable machines and in particular to a housing which muffles the noise produced by a machine such as a portable compressor.

It is well known that when construction work is being done, the noise produced by the various machine used in such construction work is disturbing to people in the vicinity of such work. This is particularly true when the work is being done in a populated area. Much of this noise is produced by the portable compressor and in particular the engine used to drive such portable compressor. The noise level has been measured at over 115 decibels. City ordinances often require that noise level be lower than 90 decibels at a certain distance. Although these ordinances vary from city to city, the noise produced by most present day machines is well above the noise level requirements of these ordinances.

Attempts have been made to reduce the sound level of these machines but most of them have been unsuccessful. The addition of ordinary exhaust mufflers to the engine does reduce the noise level, but the machine noise still exceeds a desirable level. Of the methods tried, there are two principal disadvantages. The primary disadvantage is that the machine overheats due to lack of proper ventilation. If sufficient cooling air is provided, the noise level is not adequately reduced. A second disadvantage is that the unit becomes so large that it is no longer easily moved from job to job.

One prior arrangement includes a tent which is placed around the compressor. As is well known, tents do not have much ventilation. This lack of ventilation leads to overheating of the machine. If sufficient openings are provided to permit adequate cooling, the noise travels through the openings and the level of sound is not adequately reduced. A second method of reducing noise level is to completely enclose the machine with the exception of the end where the engine fan is located. At this end a honeycomb muffling system is added. In order to be effective, this honeycomb arrangement is adequate for small machines but if this arrangement is used on large machines, the length of the honeycomb must be such that the machine is no longer portable.

SUMMARY

It is therefore the principal object of this invention to provide a muffling system for a machine which permits adequate ventilation of the machine.

It is a further object of this invention to provide apparatus which muffles the noise produced by a machine yet does not increase the size of the unit to an extent where it is no longer portable.

In general, these and other objects are carried out by providing a housing for muffling the noise produced by a machine comprising: a shell surrounding a machine; first duct means having an inlet and an outlet, said outlet communicating with the inside of said shell at one end of said shell for conducting air for cooling said machine from outside the housing to the inside of said shell; said first duct means being generally U-shaped and mounted on said shell so that its legs extentd over at least a portion of the sides of said shell and being sufficiently long to muffle the sound produced by said machine which tends to travel through the duct; said shell being provided with an exhaust opening near its other end for conducting air out of the shell.

BRIEF DESCRIPTION OF THE DRAWINGS

This invention will be described in connection with the following drawings wherein:

FIG. 1 is a perspective view of the housing of this invention with parts broken away for purposes of clarity;

FIG. 2 is a sectional view of the embodiment of FIG. 1 with a compressor shown in broken lines;

FIG. 3 is a sectional view of some of the walls of the housing of this invention;

FIG. 4 is a sectional view of other walls of the housing of this invention; and

FIG. 5 is a perspective view of a modification of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, in FIG. 2 there is shown in broken lines a compressor generally indicated at **1** powered by an engine **2**. The compressor includes air intakes **3** and filter **4**. In addition to the compressor, the engine drives a suitable fan **5** and radiator system. A muffler **6** connected to the engine exhaust is positioned in the housing. The outlet of the compressor is connected to a receiver **7** in a conventional manner. If desired, the receiver **7** may be covered with a sound absorbing material. The unit is mounted on wheels **8** to provide portability.

Referring now to FIG. 1, the housing is generally indicated at **10**. This housing includes a base **11**, a pair of sidewalls **12** and **13**, a pair of end walls **14** and **15** and a top **16**. A top wall **20**, parallel to the top **16** of the housing **10**, is mounted within the shell **10** and extends across the entire width of the housing. At the forward end of this top wall there is provided an opening **21**. A pair of wall means **23** and **24** extend downward from the top wall **20** to the base **11** to define with the top wall **20** a shell surrounding the engine and compressor. The shell means is provided with an inlet at one end in which the fan **5** is mounted and an outlet **21** at its other end.

A first duct means is provided for conducting air for cooling the engine and compressor from outside the housing to the inside of the shell. The first duct means is generally U-shaped and includes a base defined by the end wall **15** which provides an outlet communicating with the inlet of the shell. The legs of the first duct means are defined by the side walls **12** and **13**, wall means **23** and **24** and the top wall **20** to provide passages **27** and **28** having inlets **29** and **30**, respectively. In the embodiment of FIG. 1, the legs of the first duct means extend the entire length of the shell.

A second duct means **31** is defined by the top **16**, sidewalls **12** and **13** and the top wall **20** to provide a passage **31**. The second duct means has an outlet **22** and an inlet communicating with the exhaust or outlet **21** of the shell.

When the machine is operating, the fan **5** draws cooling

air through the inlets 29 and 30 of the first duct means and through passages 27 and 28 and around an arcuate portion 35 in the end wall 15 making a 180° turn and through the radiator and fan 5 into the shell. Cooling air flows all around the engine 2 and compressor 1 providing adequate ventilation. From the engine-compressor chamber, air flows through the exhaust opening 21 making a 180° turn and out the duct 31 to the duct outlet 22 where it exhausts to atmosphere.

Two important features are the cross sectional area of the passages 27, 28 and 31 and the length of these passages. The cross sectional area determines the amount of air flow and thus the amount of ventilation. The amount of sound reduction. The ducts should be sufficiently long to muffle the noise produced by the machine which tends to travel through the ducts. If these ducts were short, it would provide a short passage for noise to travel out of the inside of the shell. Although in general longer ducts mean more sound dampening, there is a point where increasing the length of the ducts no longer reduces the noise level. The wrap around design of the cooling air ducts permits a reduction in the overall size of the machine when compared with normal silencing techniques. In addition, the wrap around design provides a double-walled arrangement which further reduces noise transmission through the shell.

In FIGS. 3 and 4, the construction of the walls can be seen. The outer walls are preferably constructed in accordance with FIG. 3. Each of these walls including a supporting base member 40 which may be sheet metal. On the inside of this sheet material there is a suitable sound absorbing material 41 such as fiber glass. This insulating material is then covered with a suitable screening 42 in order to insure that the insulating material will not shred. In FIG. 4 the base material 40 is sandwiched between two layers of insulating material and two layers of screening. This particular wall construction insures that there is adequate sound absorption by the housing. The double wall construction of FIG. 4 is used in top wall 20 and inside walls 23 and 24 to insure sound deadening in both the motor and compressor chamber and the ducts 27, 28 and 31.

In order to provide access to the working parts of the machine, the housing of FIGS. 1 and 2 is provided with a double door arrangement. The sidewalls of the housing 10 are provided with doors 50 while the walls 23 and 24 are provided with doors 51. In order to permit access to the filters 4, suitable port holes and covers 52 have been provided. The controls for the machine may be mounted inside the housing or on a suitable panel outside of the housing, whichever is preferred. All exposed parts are preferably cushion mounted so that vibrations will be reduced.

In FIGURE 5 there is shown a modification of the housing of this invention. In this embodiment, the legs of the first duct means have been shortened and the second duct means has been removed. In this embodiment, the housing includes a shell, generally indicated at 60 which surrounds a compressor and engine. The first duct means 61 is generally U-shaped and is substantially the same as that shown in the embodiment of FIG. 1 except that the legs have been shortened so that they do not extend the entire length of the housing. The first duct means 61 is provided with inlets 62 and an outlet for conducting cooling air to the inside of the shell.

The shell 60 is provided with an exhaust opening 63 at the end opposite from the inlet of the shell. The location of the outlet in the top of the shell insures proper air flow through the shell. A hinged cover 64 is mounted on the top of the shell so that the opening 63 may be closed when the compressor is not in use.

In order to insure proper silencing, the entire machine of the embodiment of FIG. 5 is enclosed in the shell 60. The mufflers and the compressed air receiver are enclosed in the forward end of the shell. The mufflers exhaust through pipes 65 in the top of the shell. A pair of passages 66 are provided in one end of the shell to permit air to be compressed to reach the inlet of the compressor. Doors 67 and 68 are provided in the shell to permit access to the compressor and engine.

Using the housing of FIGS. 1 and 2, the noise level of one unit was dropped approximately 20 decibels when compared with a conventional machine. With a standard portable compressor, the noise level at 3 feet was approximately 115 dba. When the same compressor was placed in the housing of FIG. 2 and operated at the same speed, the noise level at 3 feet was approximately 82 dba. Although a noise level reduction of 10 dba. may be achieved with the use of proper mufflers and cushion mountings, the reduction of 20 dba. heretofore proved difficult.

With the embodiment of FIG. 5, the noise reduction was somewhat less due to the shortening of the side ducts and the lack of a top duct, but found to be adequate for most uses. The embodiment of FIG. 5 does, however, provide the advantage of lower height, reduced cost of manufacture and easier accessibility to the machine.

Although but two prefererd embodiments have been described, it is intended that the invention be limited solely by that which is within the scope of the appended claims.

We claim:

1. For use in combination with a machine, a housing for mufflling the noise produced by the machine comprising:
   - a shell adapted to surround a machine;
   - first duct means having an inlet and an outlet, said outlet communicating with the inside of said shell at one end of said shell for conducting air for cooling said machine from outside the housing to the inside of the shell;
   - said first duct means being generally U-shaped and mounted on said shell so that its base is substantially coincident with one end of said shell and its legs extend over at least a portion of the sides of said shell and being sufficiently long to muffle the noise produced by the machine which tends to travel through the duct;
   - said first duct means having its inlet in its legs and its outlet in its base;
   - said shell being provided with an exhaust opening near its other end for conducting air out of the shell.

2. The combination of claim 1 wherein said exhaust opening is positioned in the top of said shell, said housing further comprising a hinged cover for selectively closing said exhaust opening.

3. In the combination of claim 1, said housing further comprising second duct means having an inlet communicating with said exhaust opening and an outlet and being sufficiently long to muffle the noise produced by said machine which tends to travel through the duct.

4. The combination of claim 3 wherein the legs of said first duct means and said second duct means extend the entire length of said shell and said second duct means forms the top of the housing.

5. The combination of claim 4 wherein said shell and said first and second duct means are made of sound insulating material.

6. An air compressor comprising:
   - a frame;
   - means for supporting said frame;
   - air compressing means supported by said frame;
   - an engine supported by said frame for driving said air compressing means;
   - a shell surrounding said machine for muffling the noise produced by said engine and air compressing means and having an inlet one end and an outlet at the other end;
   - first duct means having an inlet and an outlet and mounted on said shell so that it extends over at least a portion of at least one side of said shell; and
   - fan means powered by said engine mounted adjacent

the inlet of said shell for blowing air for cooling said engine and air compressing means from the outlet of said first duct means into said shell.

7. The compressor of claim 6 wherein said first duct means is generally U-shaped with the base covering the inlet of the shell and the legs extending over at least a portion of the sides of the shell.

8. The compressor of claim 7 wherein the outlet of said shell is positioned in the top of said shell and provided with a hinged cover for selectively closing the outlet.

9. The compressor of claim 7 further comprising second duct means having an inlet communicating with the outlet of said shell and an outlet being sufficiently

long to muffle the noise produced by said engine and air compressing means which tends to travel through the duct.

10. The compressor of claim 7 wherein the legs of said first duct means and said second duct means extend the entire length of said shell.

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