

[54] **SOUND PROOFED AND AIR COOLED
SHELL FOR PORTABLE AIR COMPRESSOR**

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[58] Field of Search **417/312, 380, 234, 364;
181/36 A, 33 K**

[56] **References Cited**

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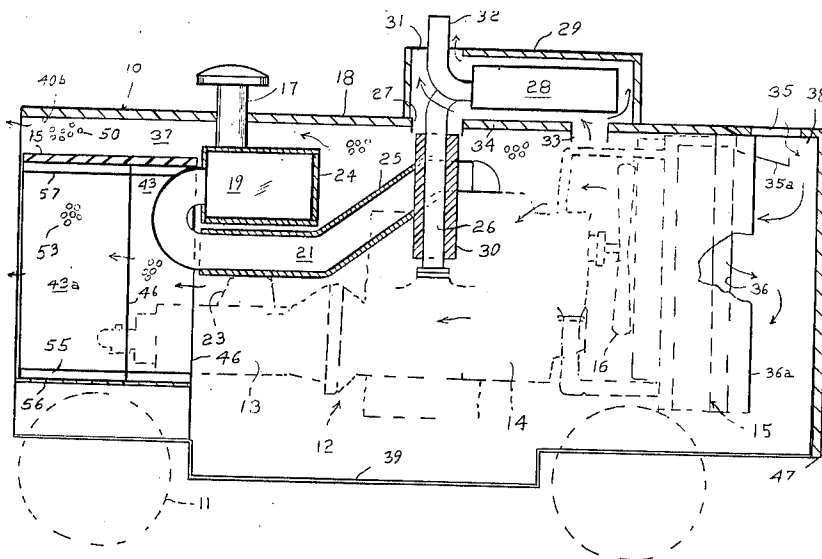
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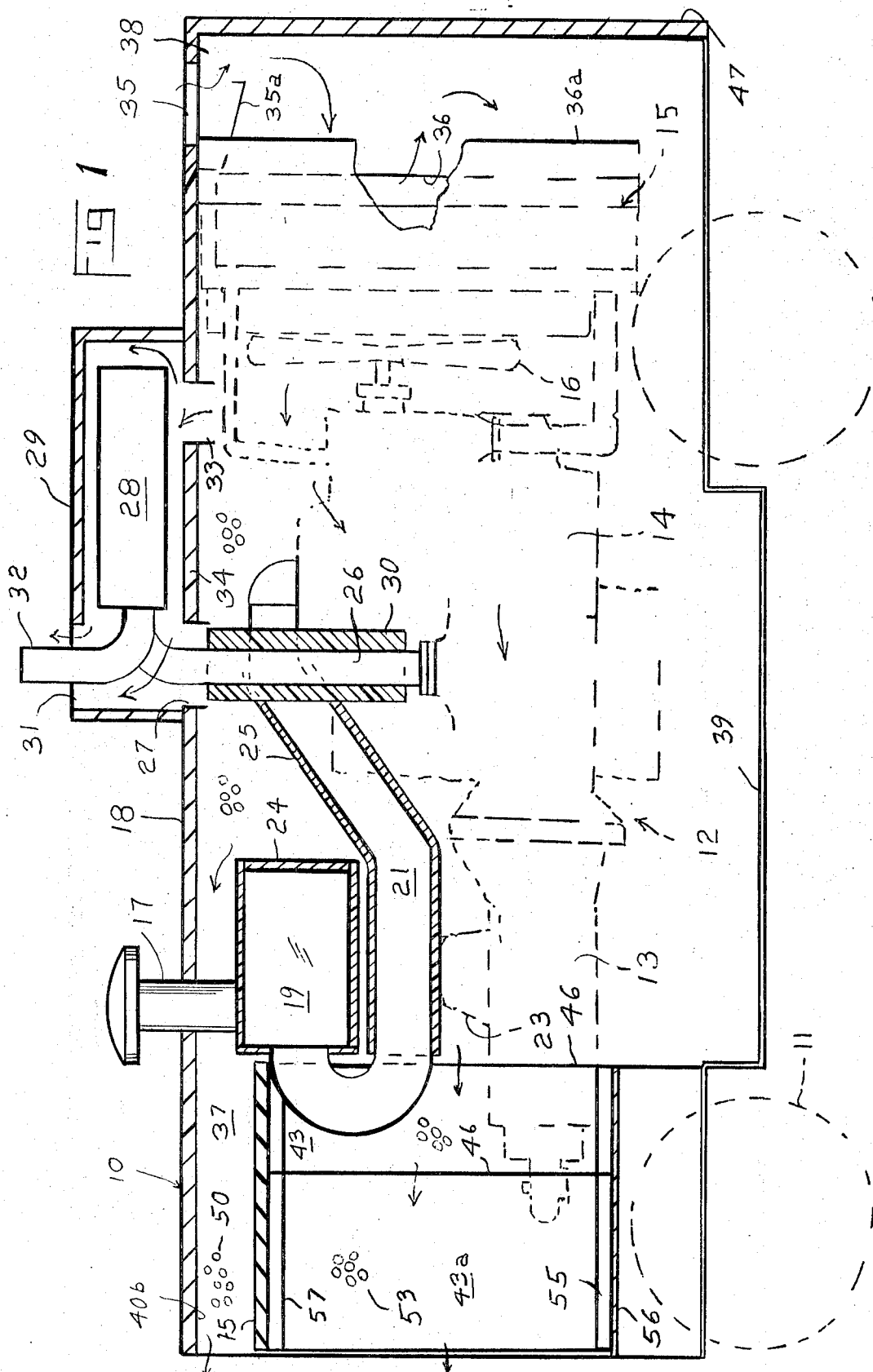
[57] **ABSTRACT**

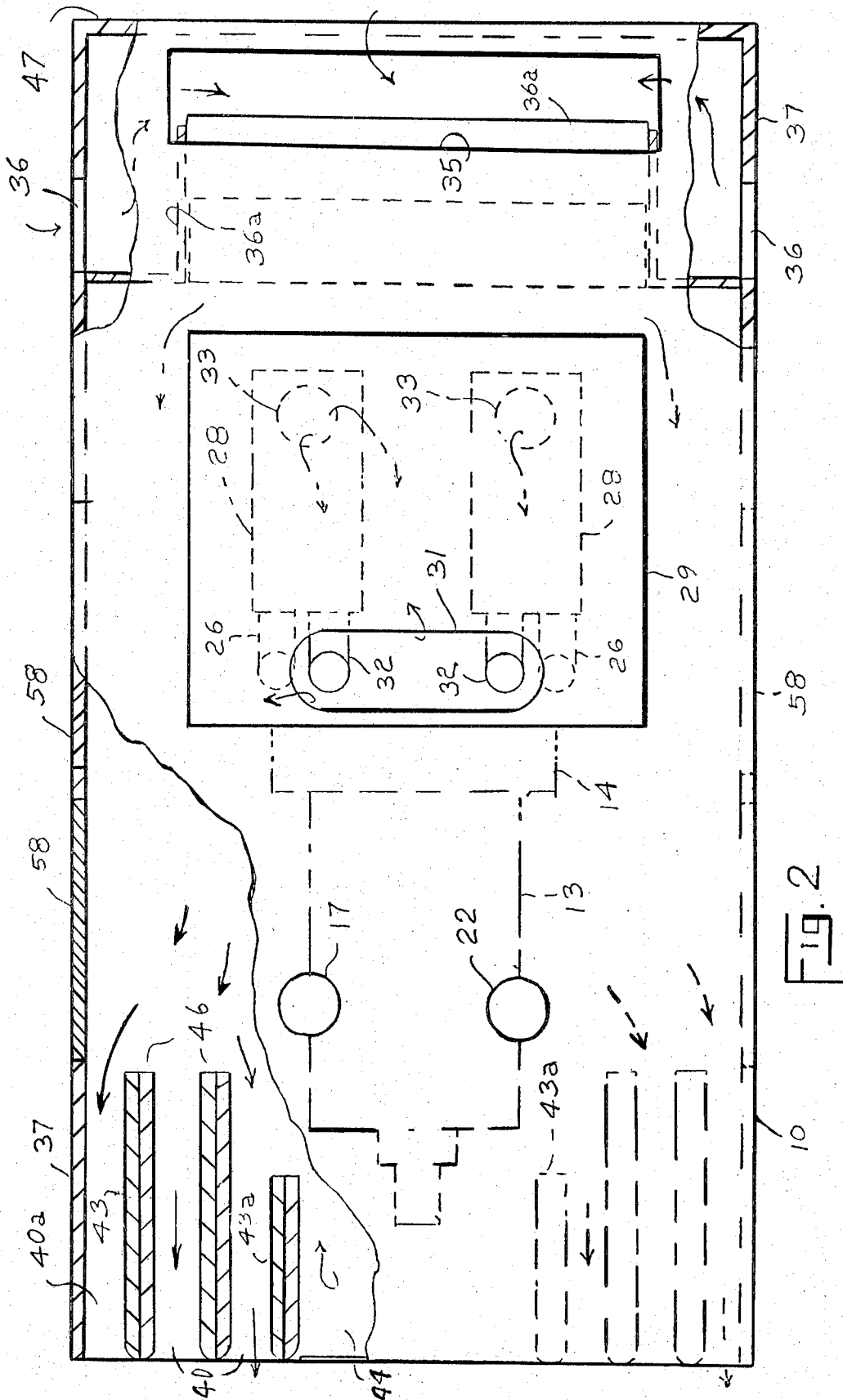
A portable compressor apparatus having a sound-proofed and air cooled shell in which a combustion engine driven air compressor unit is confined. The mufflers for the engine are located externally of the shell in a soundproofed housing through which cooling air from the shell is circulated. Cooling air is drawn by a fan through openings at the front of the shell and blown straight through the shell to a series of vent channels defined by sound attenuating panels at the rear of the shell. The sound finally issuing from the apparatus is quieted, non-irritating and at an acceptable level.

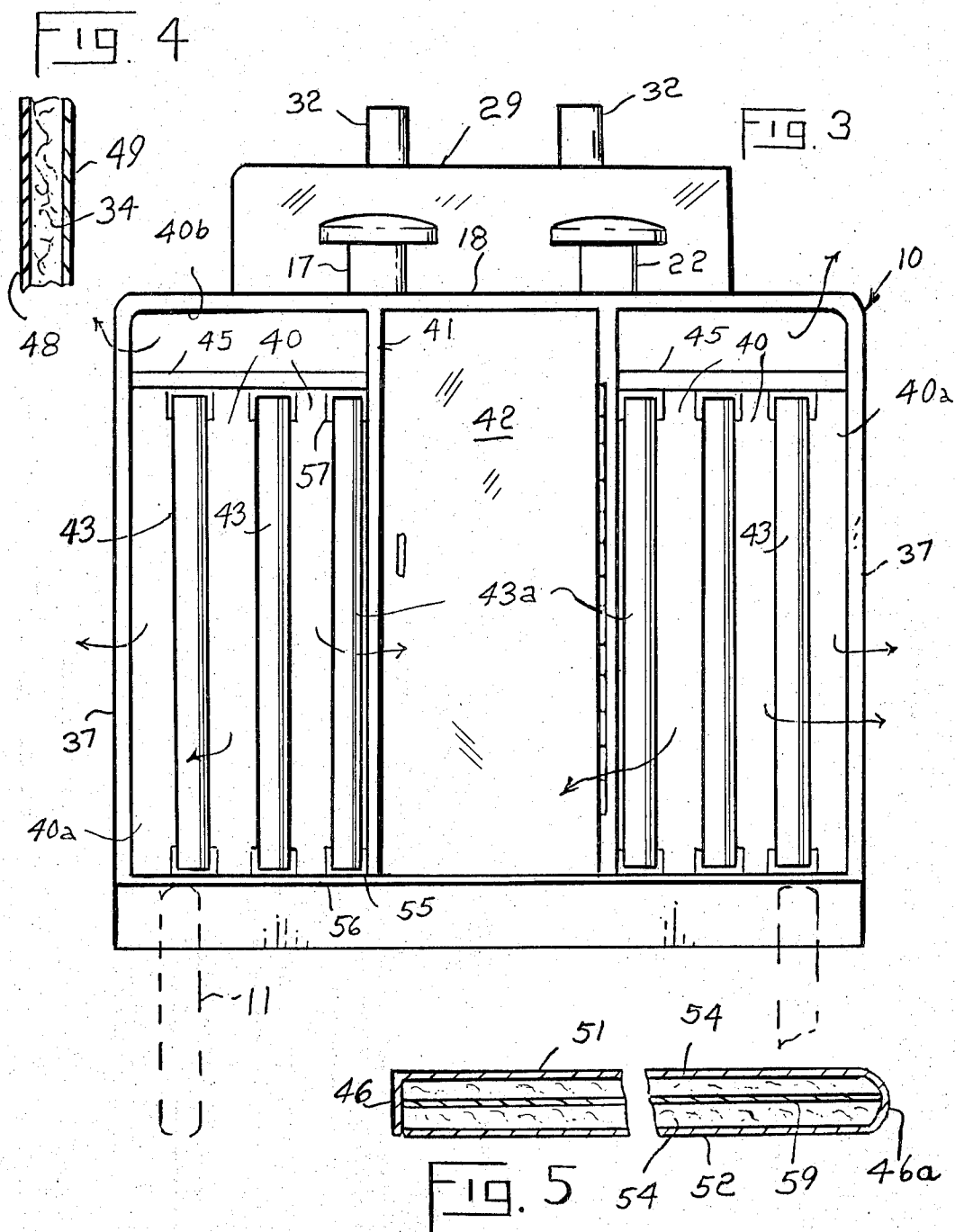
2 Claims, 5 Drawing Figures



SHEET 1 OF 3







SOUND PROOFED AND AIR COOLED SHELL FOR PORTABLE AIR COMPRESSOR

BACKGROUND OF THE INVENTION

This invention is concerned with the provision of an improved sound proof and air cooled shell for portable air compressors of the combustion engine driven type.

Portable air compressors of the combustion engine driven type are generally employed on construction projects where they are used to supply live air to operate various kinds of pneumatically powered tools and machinery, such as rock drills, hammers, pavement breakers and others. They are confined in a box-like housing or shell mounted upon wheels whereby the apparatus may be towed to a work site.

A problem associated with apparatus of this nature is the undesirable noise that accompanies their operation. Another problem is the undesirable heat generated by the apparatus which, unless relieved from the interior of the shell, causes the apparatus to overheat. It is customary during operation of conventional apparatus to leave the usual access doors of the shell open so as to get rid of the undesirable heat that is generated. While this action may aid in dissipating unwanted heat, it allows the undesirable noise accompanying its operation to issue in all its fullness and to spread broadcast through the surrounding neighborhood.

Accordingly, the general objective of this invention is to provide an improved shell that affords a practical and effective solution to these problems.

In accordance with the invention, a shell is provided for portable air compressors which serves to materially attenuate the undesirable noises accompanying their operation so that the sound issuing from the apparatus is relatively quiet or subdued, non-irritating and at an acceptable decibel level. And the shell is further designed so that cooling air drawn into the housing by an engine-driven fan not only aids in mitigating this noise but is permitted to circulate freely through the shell to relieve it and the engine compressor unit of undesirable heat.

A feature of the invention is an arrangement of acoustic elements in openings at the rear of the shell which allow free escape of heated fan-fed cooling air and simultaneously serve to mitigate the operating noise of the apparatus.

Another feature is the acoustic construction of the walls of the shell whereby the operating noise of the apparatus is further attenuated.

Another feature lies in the insulation of various components of the apparatus internally of the shell whereby heat developed in these components is prevented from being retained within the shell.

A further feature of the invention is in the arrangement of the engine's exhaust mufflers in a sound proofed housing externally of the shell and in such manner that the usual heat developing in such mufflers is prevented from being transmitted to the interior of the shell.

A still further feature of the invention lies in the general design of the shell whereby the apparatus may be operated with the several access doors in closed condition without consequent undesirable overheating while at the same time obtaining desirable noise attenuating characteristics.

The foregoing, as well as other features, objects and advantages of this invention will appear more fully hereinafter from a consideration of the detailed description which follows, taken together with the accompanying drawings wherein an embodiment of the invention is illustrated. It is to be expressly understood, however, that the drawings are for purposes of illustration and description, and they are not to be construed as defining the limits of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the accompanying drawing:

FIG. 1 is a longitudinal sectional view of a portable combustion engine driven air compressor illustrating the invention, the engine-compressor unit being shown in broken line;

FIG. 2 is a top plan view of FIG. 1 with portions broken away;

FIG. 3 is a rear end view of the machine showing the arrangement of the acoustic panels;

FIG. 4 is a fragmentary section of a wall portion of the shell illustrating its construction; and

FIG. 5 is a longitudinal section illustrating the construction of the acoustic panels.

DESCRIPTION OF PREFERRED EMBODIMENT

In the drawing is disclosed a portable compressor apparatus including a housing or shell 10 having an oblong box-like form. The apparatus is mounted upon wheels 11, and is provided with a tow bar (not shown) whereby it may be towed to a work site.

Supported and confined within the interior of the shell 10 is a compressor unit (broken lines) generally designated 12, the compressor or air end 13 of which is driven by an internal combustion engine 14. The unit 12 is cooled in usual manner by circulation of fluid through radiator means generally designated 15. The radiator means comprises the usual water radiator and oil cooler for cooling respectively the engine 14 and the air end 13 of the unit 12. An air fan 16 adjacent the radiator means is provided for drawing cooling air through the fins of the radiator means and circulating it through the shell.

An air intake pipe 17 projecting through the roof 18 of the shell is connected at its inner end within the shell with an air cleaner 19 the outlet of which is connected by piping 21 to the engine. A second similarly projecting air intake pipe 22 is also connected at its inner end within the shell with a second air cleaner (not shown), the outlet of which is connected by piping with the compressor air inlet 23.

The air cleaners and their associated piping within the shell are jacketed with thermal insulating material 24, 25 so as to prevent the metal of these elements from absorbing and retaining within the shell heat developed by the compressor unit.

Each of the exhaust ports of the engine (there being two, one on each side of the engine) is connected with a separate exhaust pipe 26. Each of the latter projects through a separate hole 27 in the roof of the shell to connect with a separate muffler 28 located externally of the shell in a separate housing 29 common to both mufflers. The exhaust pipes 26 are jacketed within the shell with thermal insulating material 30 to prevent heat developed by the exhausting gases from being conveyed from the pipes to the interior of the shell.

The muffler housing 29 is of box-form and is mounted atop the roof of the shell. It has in its top wall adjacent its rear end a common opening 31 through which a tail pipe 32 from each muffler freely projects to discharge the exhaust gases of the engine to atmosphere. This common opening is directly above the holes 27 through which the exhaust pipes 26 enter the rear end of the muffler housing.

Adjacent the front end of the muffler housing in the roof of the shell is a pair of ports 33, one below the front end of each muffler. These ports communicate the interior of the shell with the muffler housing. These ports allow cooling air blown into the shell by the fan 16 to enter the muffler housing. The mufflers are supported in the muffler housing by bracket means (not shown) in such manner that the mufflers are spaced clear of the roof of the shell and of the neighboring walls of the muffler housing, as appears in FIG. 1.

This arrangement of the mufflers allows cooling air from the interior of the shell to enter the ports 33 at the front of the mufflers and circulate freely over all areas of the mufflers toward their rear ends where the air escapes through the common opening 31 carrying with its heat developed by the mufflers. The cooling air is in effect drafted rapidly through the muffler housing by the heat of the mufflers.

The shell is provided with inlet openings 35 and 36 adjacent its front end through which the cooling air is drawn by the fan. The opening 35 (FIG. 2) extends transversely of the roof of the shell. The openings 36 (of which there are two) extend vertically of opposite side areas of the side walls 37 of the shell. Each of the openings 35 and 36 communicates directly with a space or chamber 38 located immediately forwardly of the radiator means.

The compressor unit 12 is arranged longitudinally and centrally of the shell in spaced relation to the roof of the shell and its several walls. It is supported by brackets (not shown) so that its bottom surface is spaced above the base or bottom wall 39 of the shell. This arrangement allows cooling air drawn by the fan into the shell to circulate freely through the shell whereby heat developed within the shell is readily picked up and carried through vent openings 40 in the rear wall 41 of the shell to atmosphere.

The rear wall 41 (FIG. 3) is defined in part by a closed central area provided with a door 42 which, when opened, allows access of the operator when needed to the rear end of the compressor unit. To each side of the rear door is a series or group of parallel vertical openings or vents 40. These openings are in the form of channels defined between a group of panel elements 43 that are arranged in parallel laterally spaced relation to one another. The outermost channels 40a are defined between the side walls 37 of the shell and the outermost panels 43.

The panels extend inwardly into the shell in parallel relation to the longitudinal axis of the shell for a distance slightly beyond the rear end of the compressor portion 13 of the compressor unit. The innermost panels 43a adjacent the sides of the rear door 42 define a wide space 44 between them into which the rearmost portion of the compressor 13 freely projects. These innermost panels 43a are preferably slightly shorter in length than the others so as to provide a desirable clearance between them and the wider neighboring portion

of the compressor unit that allows for free circulation of cooling air to space 44.

Overlying each group of panels is a separate horizontally disposed baffle panel member 45 (FIGS. 1, 3) whereby a further channel 40b is defined above each group of panels for exiting of cooling air from the shell.

The arrangement of the several panels and baffle panel members is such that the fan blown air mass flowing through the shell is caused to be divided by the leading ends 46 of the several panels into a series of streams of lesser mass prior to exiting from the shell. The panels are of narrow dimension so that the leading ends 46 of the several panels which cause the division of the air into multiple streams effect this division without developing undesirable eddy currents and back pressures.

It can be seen by the foregoing construction of the shell that cooling air is drawn by the fan into the shell from the inlet openings 35, 36 at the front end of the shell; and it is blown in a substantially linear or straight path through the shell over the compressor unit and exits freely without undesirable back pressure and eddy currents through the channel openings 40 at the rear end of the shell. Some of the cooling air mass is pushed through the ports 33 by the cooling fan and is caused to circulate freely through the muffler housing to the vent opening 31 at the top of the muffler housing.

Besides allowing free unimpeded flow of cooling air through the apparatus, the apparatus is designed to materially attenuate the usual undesirable noise accompanying the operation of the apparatus. The noise produced by conventional apparatus of this nature without sound attenuating features is an objectionable and irritating complex pattern of sounds characterized by a high decibel level varying in intensity and pitch.

Toward the objective of attenuating the noise generated by the apparatus so that the sound issuing from it will be relatively quiet, non-irritating and at an acceptable decibel level, the shell is designed to deaden and acoustically attenuate the noise.

To this end, the side walls 37, the roof 18 and the front end wall 47, as well as the several access doors to the shell, are formed—as indicated in FIG. 4—of inner and outer metal sheets 48 and 49 between which is sandwiched sound absorbing or deadening insulation material 34, such as fibre glass. The inner sheets 49 are perforated over their entire areas with a large number of small holes 50 (FIG. 1). By means of this construction, sound waves generated by the operation of the compressor unit are deadened as they strike the opposing walls of the shell. Further, as the sound waves move over the inner wall surfaces, they enter the numerous small holes. These holes in association with the porous fibre glass material define numerous acoustic chambers. Some of the sound waves are deadened and absorbed as they strike and filter through the fibre glass; and some of the waves that are deflected back through the holes 50 by the fibre glass material are materially attenuated. This attenuation and absorption of sound is extensively repeated as the sound waves pass from hole to hole in moving toward the vents 40 defined by the groups of panels at the rear of the shell.

The usual access doors 58 at the sides of the shell as well as rear door 42 are soundproofed in the manner of the walls of the shell; and they are normally closed during operation of the apparatus so as not to allow the op-

erating noise of the compressor to spread broadcast to atmosphere.

The several panel elements 43, 45 at the rear of the shell and their particular arrangement serve acoustically to further attenuate the sound waves passing over them. Each panel is a unit having a laminated structure, as in FIG. 5, comprising a pair of laterally spaced parallel sheet metal walls 51 and 52, each perforated over its entire area with a large number of small holes 53 (FIG. 1). The walls 51 and 52 are joined at their forward and rear ends to provide a squared leading end wall 46 and a rounded opposite or trailing end 46a. A third or intermediate sheet metal wall 59, which is parallel to the other two, partitions the spacing between the outer walls into a pair of compartments that are filled with sound deadening or absorption material 54, such as fibre glass. This intermediate third wall is solid or unperforated. By this arrangement, numerous sound attenuating chambers are formed at both sides of each of the panel units.

It can be seen in this arrangement of the acoustic panel units 43, 45 that as the cooling air mass flows toward the rear exit end of the shell under the driving force of the rotating air fan, it is divided into a series of streams of lesser mass by the leading ends 46 of the several panel units. The divided streams flow laminarly over the outer surfaces of the panel units. In this action, the sound waves impressed upon the air stream in moving through the shell are further acoustically attenuated and deadened in the manner earlier explained as they move relative to the numerous sound chambers defined by the holes 53 and the sound absorption fibre glass material in the panel units.

It is known that when a large mass of air moving under a driving force exits from an enclosure, it expands noisily as it exits to atmosphere. Here, however, through the action of the panel unit arrangement in dividing this large mass of air into a multiple number of streams of lesser volume, this expansion effect is effectively mitigated. Further, by providing a multiple number of sound attenuating panel units, the sound chamber surface area over which the exiting air flows is materially increased or lengthened with beneficial sound attenuating results.

The walls of the muffler housing 29 are also sound proofed in the manner of the walls of the shell. Further, the exiting arrangement of the muffler exhaust tail pipes 32 to the common opening 31 also provides desirable sound reducing advantages. Since the tail pipes 32 become hot from the exhausting engine gases, the cooling air circulating from the shell through the muffler housing and exiting through the common top opening 31 tends to be drawn to the hot tail pipes so as to flow laminarly along their surfaces to finally merge with the hot exhaust gases issuing from the tail pipes. In this manner, there is no undesirable noisy expansion of the cooling air when exiting from the muffler housing to atmosphere.

The top inlet 35 and the side inlets 36 are also treated for noise reduction in that an acoustic deflector panel 35a is suspended below the inlet 35 in the path of the noise waves; and in that acoustic panels 36a at opposite sides of the radiator means 15 opposite the inlets 36 require the noise waves to make several right angular turns before they can pass out of the inlets 36.

The several panel units 43 are arranged for easy installation or removal for repairs or replacement. To this

end, each panel unit is removably seated in a pair of channel elements, a lower one 55 of which is secured to a floor or base portion 56 of the shell and an upper channel element 57 of which is secured to the underside of the baffle plate 45. The panel units are adapted to be slidably entered through the rear of the shell into the channel elements and secured therein by suitable fasteners.

While an embodiment of the invention has been illustrated and described in detail herein, it is to be expressly understood that the invention is not limited thereto. Various changes can be made in the design and arrangement of the parts without departing from the spirit and scope of the invention as the same will now be understood by those skilled in the art; it is my intent, therefore, to claim the invention not only as shown and described herein but also in all such forms and modifications as may reasonably be construed to fall within the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. A sound proofed and air cooled portable compressor apparatus comprising a box-like shell having a roof, side walls, a front wall and a rear wall, a combustion engine driven air compressor unit confined within the shell provided with cooling radiator means at its forward end and with an engine driven fan located between the engine and the radiator means for drawing cooling ambient air through the radiator means and blowing it over the unit and through the shell, an air inlet chamber defined at the forward end of the shell between the front wall and the radiator means, air intake openings adjacent the front wall formed in the roof and side walls and opening directly onto the chamber for allowing ambient air to be drawn by the suction of the fan into the chamber and through the radiator means, multiple vent openings formed in the rear wall communicating directly into the rear of the shell for allowing exit of air blown by the fan through the shell, the vent openings comprising a plurality of channels extending forwardly partway into the shell, and there being a plurality of acoustic sound attenuating panels arranged in the rear area of the shell parallel to each other and to the longitudinal axis of the shell and defining the channels, the direction of movement of the ambient air drawn into the chamber being linearly from the chamber at the front end of the shell to the vent openings at the rear end of the shell.

2. A sound proofed and air cooled portable compressor apparatus comprising a box-like shell having a roof, side walls, a front wall and a rear wall, a combustion engine driven air compressor unit confined within the shell provided with cooling radiator means at its forward end and with an engine driven fan located between the engine and the radiator means for drawing cooling air through the radiator means and blowing it over the unit and through the shell, a chamber defined in the shell between the front wall and the radiator means, air intake openings adjacent the front wall formed in the roof and side walls opening directly into the chamber for allowing ambient air to be drawn by the suction of the fan into the chamber and through the radiator means, and multiple vent openings formed in the rear wall communicating directly into the rear of the shell for allowing exit of air blown by the fan through the shell, the vent openings comprising a plu-

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ality of channels extending forwardly partway into the shell, there being a plurality of acoustic sound attenuating panels arranged in the rear area parallel to each other and to the side walls of the shell defining the channels, and a sound proofed muffler housing 5 mounted atop the roof of the shell, a pair of exhaust coupled to the engine located externally of the shell in the muffler housing, each muffler having an engine exhaust inlet pipe and an exhaust discharge pipe projecting from its rear end, the inlet pipe depending freely 10 through a hole in the roof of the shell and coupled to

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the engine, the discharge pipe extending upwardly and freely through a hole in the roof of the muffler housing, the said holes in the roof of the shell and in the roof of the muffler housing being aligned with each other, the mufflers being supported in the muffler housing in spaced relation to the walls of the latter, and there being a cooling air inlet opening through the roof of the shell immediately rearwardly of the fan into the muffler housing adjacent the front ends of the mufflers.

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