Oct. 12, 1971

A. J. MANGANARO

3,611,743

ROOM AIR CONDITIONER

Filed Nov. 19, 1969

5 Sheets-Sheet 1

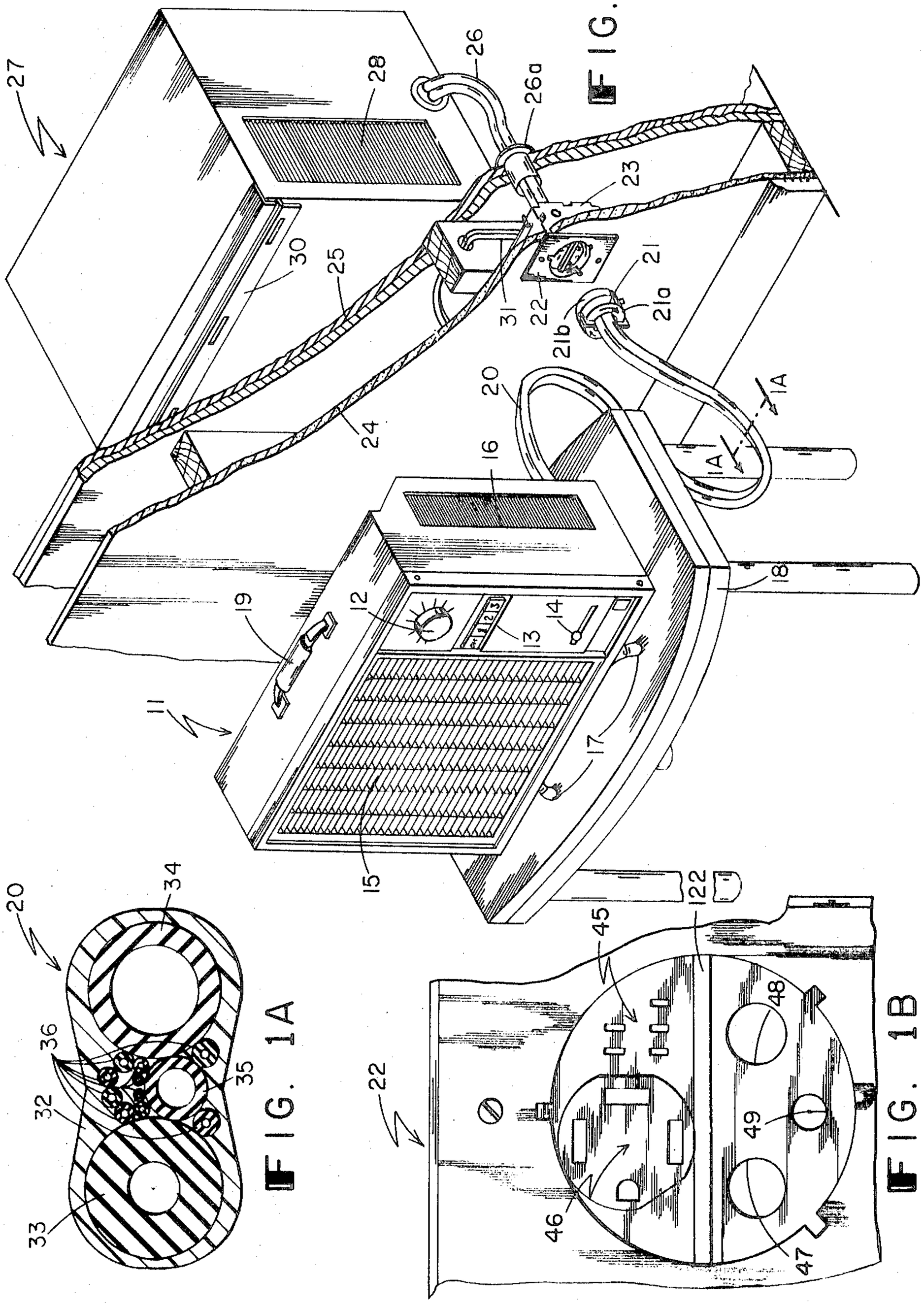

FIG. 1

FIG. 1A

FIG. 1B

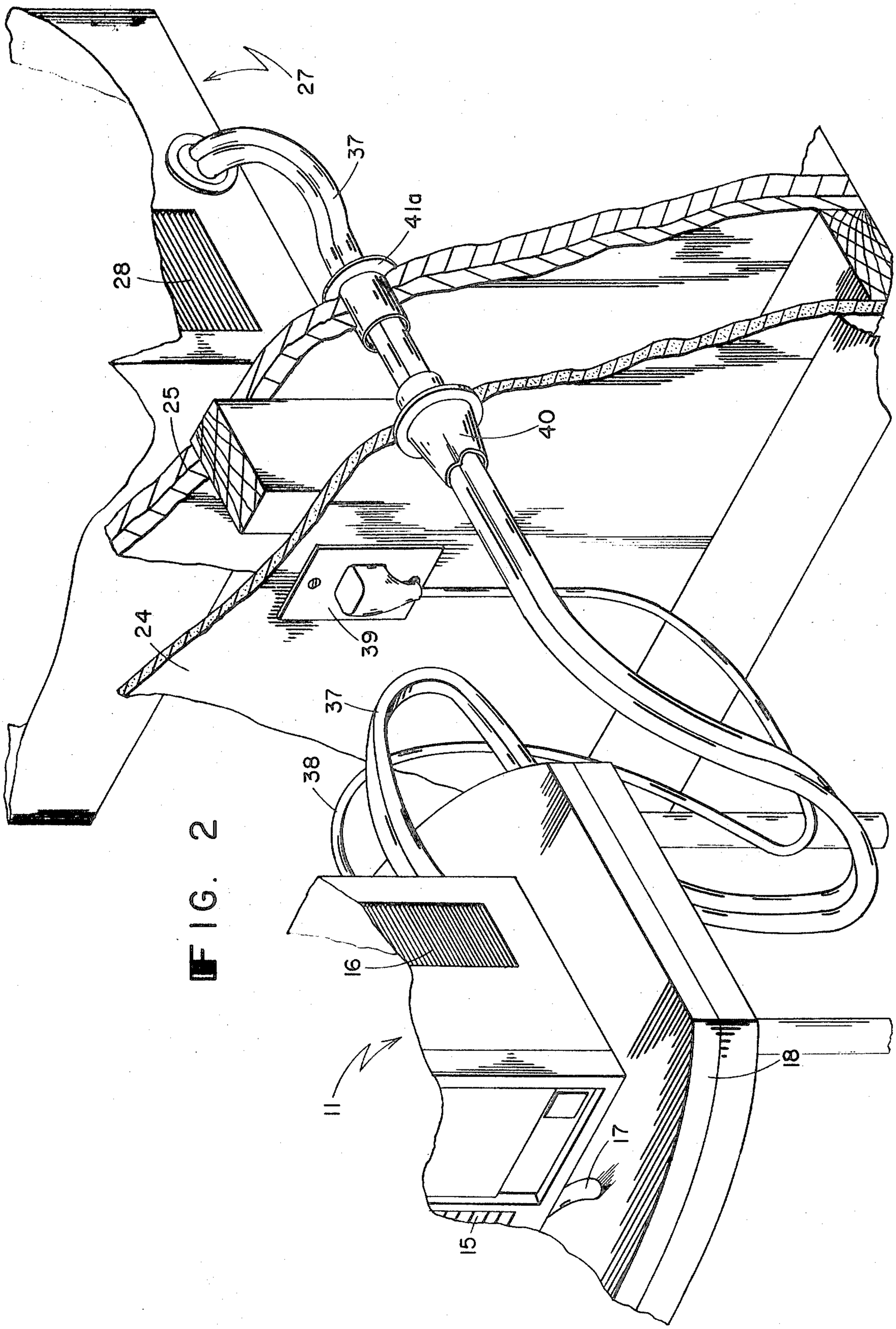

FIG. 2

Oct. 12, 1971 A. J. MANGANARO 3,611,743

ROOM AIR CONDITIONER

Filed Nov. 19, 1969 5 Sheets-Sheet 5

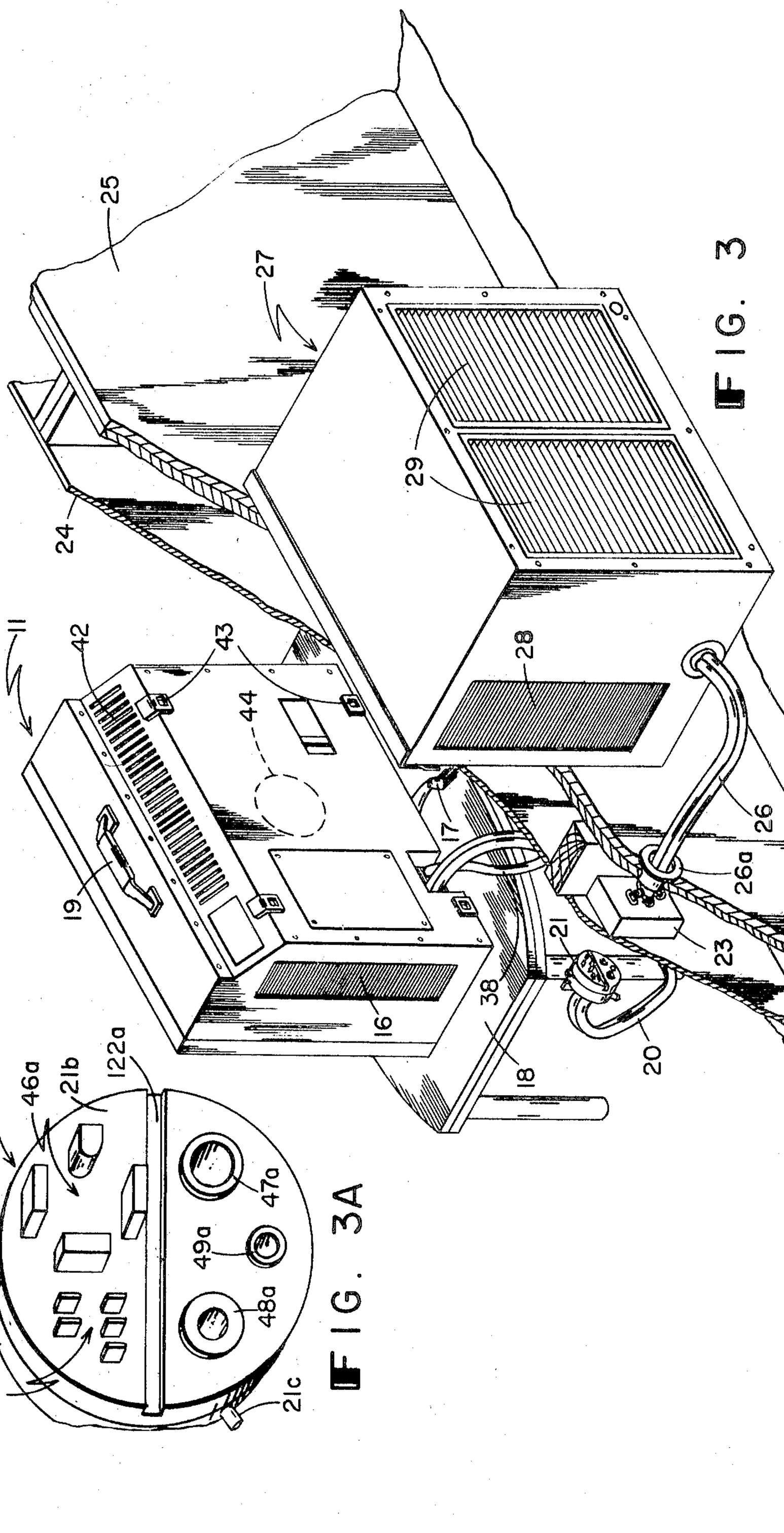

FIG. 3

FIG. 3A

Oct. 12, 1971 A. J. MANGANARO 3,611,743

ROOM AIR CONDITIONER

Filed Nov. 19, 1969 5 Sheets-Sheet 4

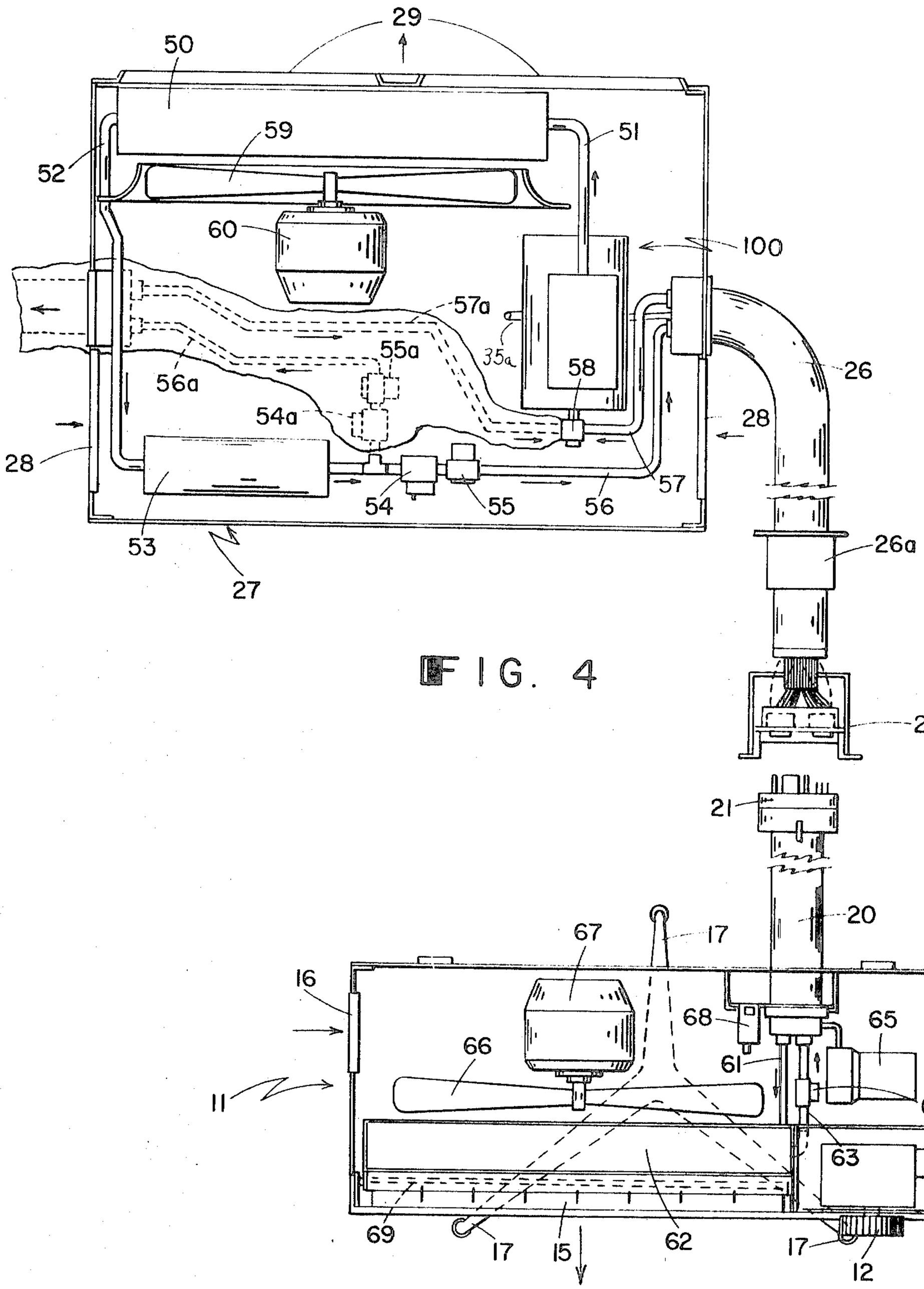

FIG. 4

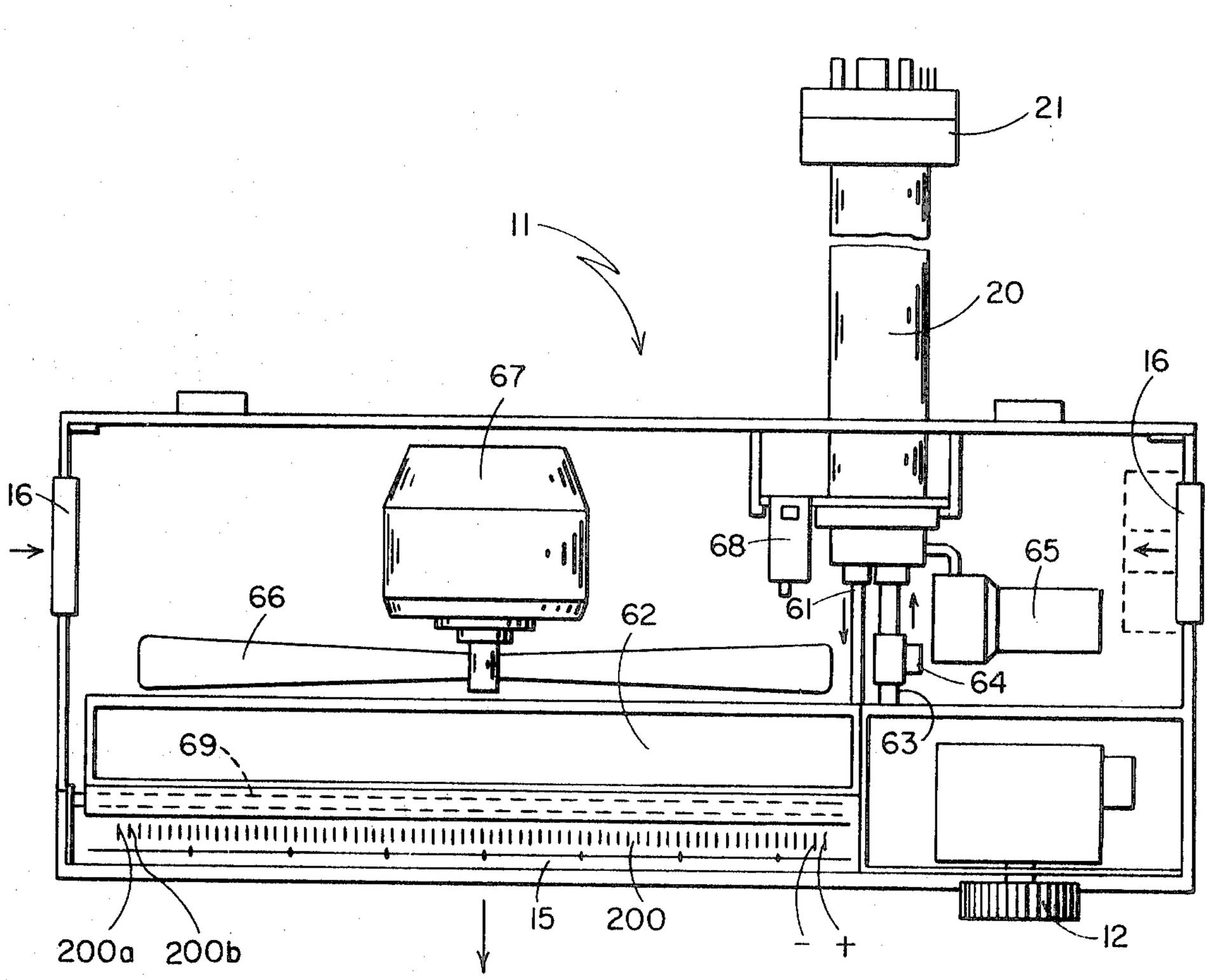

FIG. 5

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ROOM AIR CONDITIONER

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Int. Cl. F25d *23/12*
U.S. Cl. 62—263 7 Claims

ABSTRACT OF THE DISCLOSURE

A room air conditioner is described which can be positioned anywhere in a room, does not require a window and is much quieter than conventional units. It comprises separate interior and exterior assemblies, with the interior assembly containing the evaporator and the exterior assembly the condenser and compressor. Flexible conduits, preferably detachable, are used to interconnect the refrigerant lines between the interior and exterior assemblies.

BACKGROUND OF INVENTION

This invention relates to room air conditioning units. In particular, it relates to a novel form of room air conditioning unit which permits far greater flexibility of use and installation than has hitherto been described.

Previously described room air conditioning units have generally been constructed so as to extend through a wall or window. In one type of modification for double hung windows, the frame of the unit has a slot so that the window can go down lower and thus make a better, quieter seal. In another type of modification, the unit is divided into inside and outside components with a rigid duct connecting the components together. However, all of these hitherto described room air conditioning units have required a fixed installation as regards the portion within the room.

One object of the present invention is to provide a room air conditioning unit wherein the portion within the room can be readily and easily moved to substantially any position within the room and retain its operability.

Another object of this invention is to provide such a room air conditioning unit which can be readily and easily installed by a user with a minimum of professional assistance.

Still another object of this invention is to provide such a unit wherein the portion within the room can be readily disconnected without affecting the portion outside the room and vice versa.

A further object of this invention is to provide a room air conditioner that does not need a window.

Another object of this invention is to provide such a unit which is quieter than conventional air conditioners.

Further objects and advantages of this invention will be apparent from the description and claims which follow, taken together with the appended drawings.

SUMMARY OF INVENTION

The invention comprises a room air conditioning unit consisting of several parts. One is a separate assembly which is to be used in the interior of the room and comprises an evaporator, a motor driven fan for cooling the air passed over the evaporator, means for collecting and expelling moisture condensed by the evaporator, accessible electric controls and input and output refrigerant lines for the evaporator. A second part comprises a separate assembly to be used outside the room or in the open air and consists of a compressor, a condenser, a motor driven fan for cooling the refrigerant within said condenser, means for eliminating moisture expelled by the interior assembly, and input and output refrigerant lines linked to said compressor and condenser. A third part is a flexible conduit

leading from the interior assembly and containing within it flexible tubes connecting to the refrigerant lines, as well as flexible electric lines and a condensate line. The flexible tubes and lines are preferably embedded in a flexible sheath so as to be proof against leakage, weather and shock. A fourth part is a similar flexible conduit leading from said exterior assembly. A fifth part is a conduit extending through a wall of the room and adapted to act as a plug-in wall connector between the two flexible conduits in one model or, in a second model, as a sleeve where both conduits are combined in a single conduit.

The interior assembly is completely portable and movable and can, depending on the length of its conduit, be readily positioned in any desired location without affecting its operability. The flexible conduit from the interior assembly can also include the electric power line so that disconnecting will completely disconnect both exterior and interior assemblies from electric power. The exterior assembly can likewise be positioned where desired, although it would generally be adjacent the exterior wall in the open air. The interior assembly is preferably designed so as to have intake surfaces on the rear and sides and an output on the front. In its preferred form, a pump is provided in the interior assembly to expel the condensate into its channel through the flexible conduit to the exterior assembly where the condensate is eliminated.

In the model utilizing a plug-in wall connector, the flexible conduit of the interior assembly terminates in a plug which is readily connected to the wall connector. The plug combines prongs for electrical lines and tubular plugs for condensate and refrigerant lines. The wall connector includes a receptacle with conductive slots and tubes registerable with said prongs and plugs. The coupling is preferably of the "quick-disconnect" type wherein the back portion of the plug is twisted on a threading to cause proper engagement and locking. The tubes and tubular plugs are preferably pressurized so that they are sealed when uncoupled.

The interior assembly may include a heating coil which would permit warm, filtered, forced air circulation in the winter.

The interior assembly may also include an electrostatic precipitator so that the unit provides air sufficiently free of pollutants to permit its use as an air conditioning unit by persons who have respiratory problems. The electrostatic precipitator may be located at an air intake louver on the rear or side of the interior assembly, or, at the air output on the front of the interior assembly.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view with partial cutaway of one embodiment of this invention showing the interior assembly supported on a table in a room and the outer assembly attached to the exterior surface of the wall, which is shown in partial breakaway.

FIG. 1A is a section along line 1A—1A taken across the flexible conduit.

FIG. 1B is an enlarged front view of a portion of the receptacle **22** shown in FIG. 1.

FIG. 2 is a perspective view with partial breakaway of the embodiment of FIG. 1 wherein there has been a modification of the conduits and connections.

FIG. 3 is a reverse perspective view of the embodiment illustrated in FIG. 1, with partial breakaway.

FIG. 3A is an enlarged perspective view of the plug **21** illustrated in FIG. 3.

FIG. 4 is a schematic plan view of the inner and outer assemblies of this invention with the covers removed to expose the components.

FIG. 5 is a view as in FIG. 4 wherein an electrostatic precipitator has been schematically included.

SPECIFIC EXAMPLE OF INVENTION

Referring now to the drawings, there is illustrated therein a separate interior assembly **11** and a separate exterior assembly **27**. The interior assembly **11** is connected to the exterior assembly **27** by means of a flexible conduit **20**, by suitable plugs and further conduits through the wall **24–25**. Variations in the construction of the conduits, plugs and connections will be explained below. The immediately following description relates primarily to the embodiment illustrated in FIGS. 1, 1A, 1B 3, 3A and 4.

The interior assembly **11** comprises a frame and housing for supporting and permitting the functioning of an evaporator **62**, a motor **67** driving a fan **66** for the evaporator **62**, input and output lines **61** and **63** for conveying the refrigerant to and from the evaporator, a solenoid valve **64** for controlling the flow of refrigerant, and a pump **65** for removing the condensate formed in the interior assembly **11**. Interior assembly **11** is provided with an electric socket **68**, an optional electric heating element **69**, handle **19**, wall brackets **43**, panel **44** and a large front louver section **15** for permitting passage of air through the evaporator **62** to the surroundings. The intake air is from side louvers **16** and rear louver **42**. The assembly **11** is shown supported by its legs **17** on a table **18**. The front panel of the assembly contains the temperature control **12**, fan speed selector buttons **13**, and heat control **14**.

Extending from the interior assembly is a flexible conduit **20** which is made up of an outer flexible cover **32**, a flexible pressurized and insulated refrigerant supply line **33**, a flexible pressurized and insulated refrigerant return line **34**, a flexible water condensate line **35** and a number of power and electrical control cables **36**. The composite cable **20**, whose cross section is illustrated in FIG. 1A, terminates in a quick connector plug **21**. Plug **21** has a front engaging portion **21***b*, rotatable locking portion **21***a* with lugs **21***c*, and slot **122***a* engageable with receptacle **22** having protuberance **122**. Prongs **45***a* are connected to electrical control cables and prongs **46***a* are connected to electric power cables. The lower half of the connector shows flexible tubular protuberances **47***a*, **48***a* and **49***a* which connect respectively to refrigerant return line **34**, refrigerant supply line **33** and water condensate line **35**. The plug couples into receptacle **22**, supported on service box **23**. In the receptacle, the electric power slots **46** are arranged to mate with prongs **46***a*, slots **45** with prongs **45***a*, and openings **47**, **48** and **49** with tubular protuberances **47***a*, **48***a* and **49***a* respectively.

The receptacle **22** is shown in FIG. 1 mounted in the interior panel **24** of the wall. The electric service cable **31** is connected to the back of the wall receptacle **22** and is fed from service located within the wall. The electrical control lines connected to recesses **45**, and the refrigerant and condensate conduits connected to the openings **47**, **48** and **49** extend within cable **26** through holder **26***a* in outer wall panel **25** and run to the base of the exterior assembly **27**.

Exterior assembly **27** comprises a housing in which are located a condenser **50** fed by an input refrigerant line **51** from a compressor **100**. The return refrigerant conduit in flexible conduit **26** is connected through a flow valve **58** to compressor **100**. The condenser output line **52** feeds into refrigerant receiver **53**, thence through solenoid valve **54** and expansion valve **55** to the refrigerant line **56** which forms part of flexible cable **26** and connects through slot **48***a* with the flexible refrigerant line **33** in flexible conduit **20** leading into the input pipes **61** feeding the evaporator **62** in the interior assembly **11**. Condensate line **35***a* in flexible conduit **26** expels its moisture into a collection trough at the bottom of the exterior assembly, from which it is eliminated into the atmosphere.

Where an additional interior assembly is to be connected to the same exterior assembly, the dotted lines in FIG. 4 indicate the connections for such an additional optional system. The refrigerant line **57***a* and the refrigerant line **56***a* are connected to corresponding flexible conduits and a second flexible conduit leading to a similar interior assembly.

The refrigerant within condenser **50** is cooled by the flow of air driven by the fan **59** powered by motor **60**. The air enters through side louvers **28** and exits through rear louvers **29**.

The exterior assembly may be supported on the ground or on the wall **25** by a mounting bracket **30**.

In the embodiment illustrated in FIG. 2, the interior and exterior assemblies are of similar construction. However, instead of the electric service line being included in the flexible cable, the flexible cable **37** includes only the refrigerant input and output lines, power line for interior and exterior assembly, condensate line and the electrical control lines. The service is now separate and fed from cable **38** which terminates in a plug connected to a normal electric service outlet **39** mounted in the wall **24**. The flexible cable **37** is carried through wall sleeves **40** and **41***a* and terminates in the exterior assembly.

In the embodiment illustrated in FIG. 5, an electrostatic precipitator **200** is shown schematically positioned adjacent grill **15**. The alternately positioned positively and negatively charged plates **200***a* and **200***b* are maintained at a high DC potential.

I claim:

1. A room air conditioning unit comprising an interior assembly in a separate housing, an exterior assembly in a separate housing, and conduit means; said interior assembly comprising an evaporator, a fan for driving air through the evaporator, means for collecting moisture from said evaporator, accessible controls, and refrigerant lines connected between said evaporator and conduit means; said exterior assembly comprising a compressor, a condenser, a fan for driving air through the condensor, and refrigerant lines connected to said conduit means; said conduit means comprising a flexible conduit containing flexible lines connecting the refrigerant lines and a moisture collecting line of the interior assembly to a first coupling member and a second conduit connecting the refrigerant lines of the exterior assembly and a moisture collecting line to a second coupling member; said coupling members being readily detachable plug and socket members.

2. The unit of claim **1** wherein said flexible conduit means also includes lines electrically connecting said interior assembly with said exterior assembly.

3. The unit of claim **2** wherein said interior flexible conduit also includes the electric power supply for said interior assembly.

4. The unit of claim **1** wherein said second coupling member is adapted to be mounted in a wall.

5. The unit of claim **1** wherein said flexible conduit comprises a flexible sheath in which said flexible lines are embedded.

6. The unit of claim **1** wherein an electrical heating element is included in the interior assembly.

7. The unit of claim **1** wherein an electrostatic precipitator is included in the interior assembly.

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U.S. Cl. X.R.

62—262, 297, 298