April 23, 1968 W. A. McCORMICK, JR 3,378,959

APPARATUS FOR DEFLASHING MOLDED GOODS

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Fig. 2.

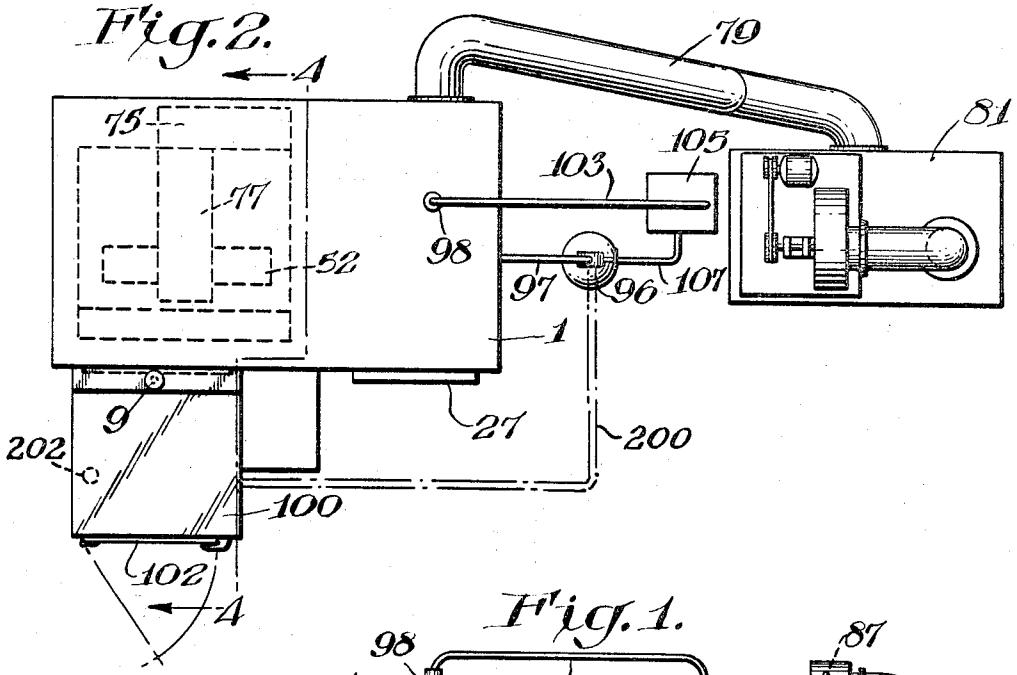

Fig. 1.

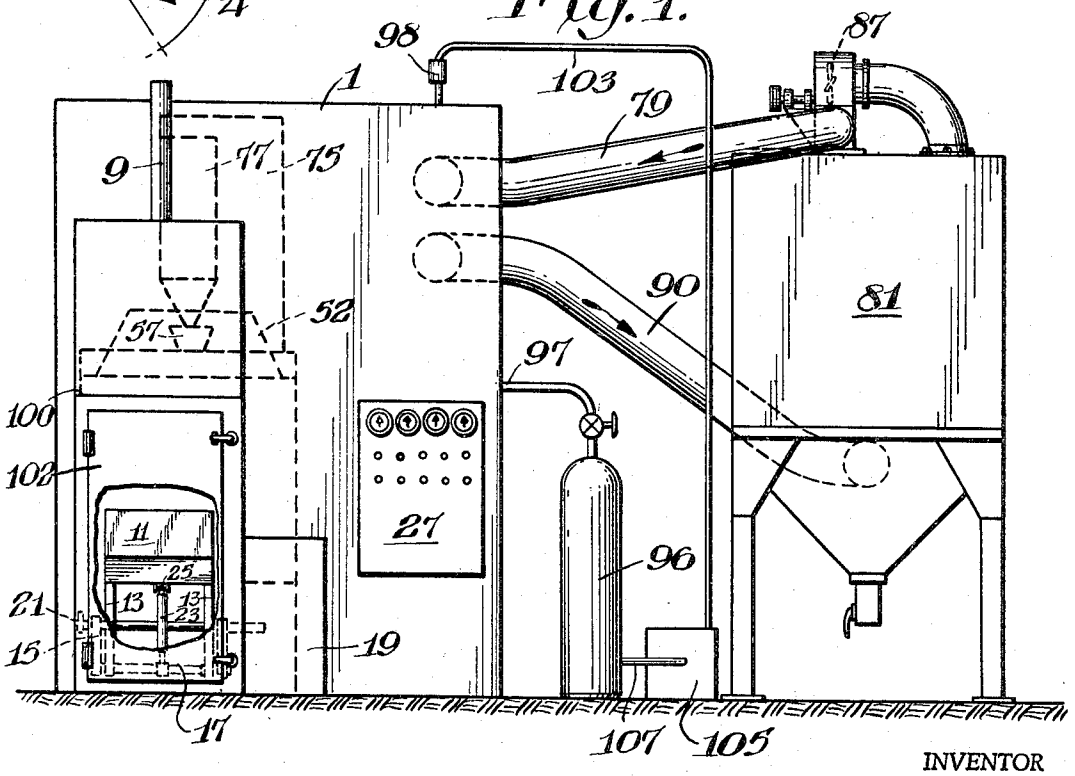

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Fig. 3.

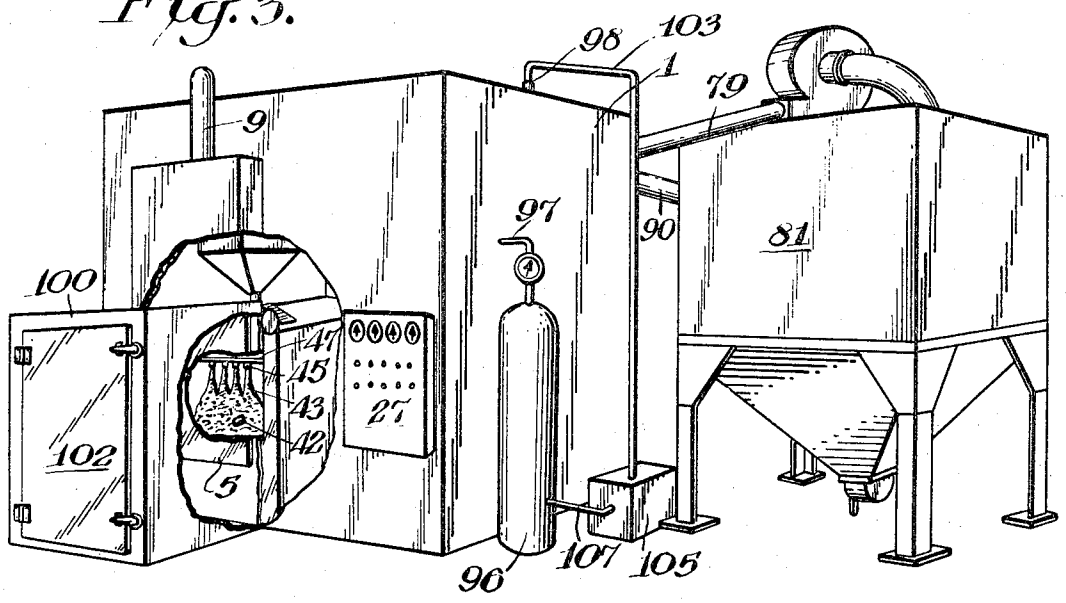
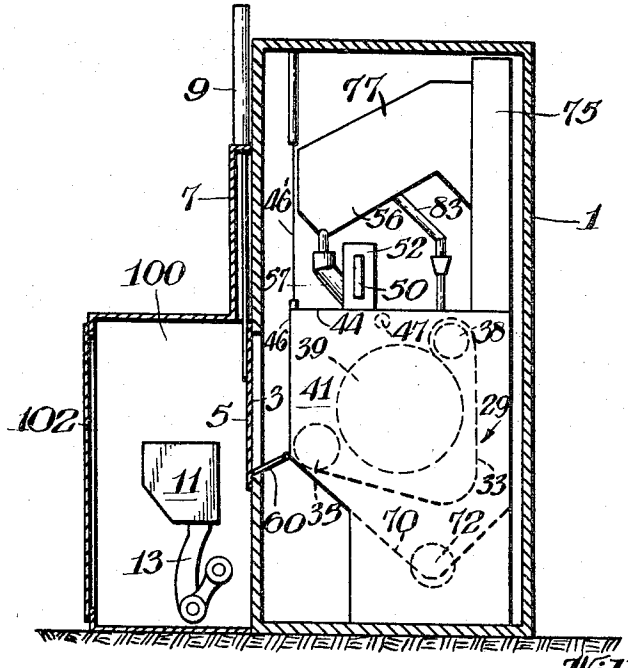


Fig. 4.



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United States Patent Office 3,378,959
Patented Apr. 23, 1968

3,378,959

APPARATUS FOR DEFLASHING MOLDED GOODS

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Filed July 29, 1964, Ser. No. 385,884
15 Claims. (Cl. 51—13)

ABSTRACT OF THE DISCLOSURE

Molded goods are deflashed in a gas pressurized chamber which has an air locking chamber at its entrance and an externally disposed dust collector communicating with the gas chamber. Gas return means connect with the pressurized chamber for recirculating filtered gas back to the pressurized chamber.

The present invention relates to an apparatus for removing trimmings, flashings, fins, etc. from cooled molded resilient pieces by use of abrasive blasting equipment, particularly those pieces molded or otherwise formed from rubber.

Molded rubber or thermoplastic goods after they have been cooled are conventionally deflashed by abrasive blasting equipment in a refrigerated room. Such rooms must include special provisions for operating the equipment therein because of the low operating temperature in the room. Additionally, the refrigerated rooms include bulky dust collectors for filtering the air in the room. The dust collector in the room necessitates using a considerably larger room which, in turn, increases the cost of refrigerating the room. Consequently, the unit cost of the equipment and the room is so great that small manufacturers of molded good can not afford the investment.

One object of the present invention is to provide a simple and economical apparatus for deflashing molded goods with abrasive blasting equipment particularly with respect to greatly lowering the unit cost.

Other objects and advantages of the invention will become more apparent from a study of the following description and drawings wherein:

FIG. 1 is a front view of one embodiment of this invention;

FIG. 2 is a top view of the embodiment shown in FIG. 1;

FIG. 3 is a perspective partly broken away of the embodiment shown in FIGS. 1–2; and

FIG. 4 is taken along line 4—4 of FIG. 2.

Referring now to FIGS. 1–4 which show the general makeup of the apparatus, an overall housing **1** is provided and serves as a pressure chamber in which the operating unit of the apparatus is housed. As shown better in FIGS. 3 and 4, the housing **1** has formed heavy walls. The wall panels are preferably formed of inner and outer sheets of plywood which form a sandwich structure with insulation such as Fiberglas between the plywood sheets. The exterior of the housing **1** is preferably clad with galvanized steel backers or sheets.

Housing **1** is maintained under pressure by dry air or any dry gas such as carbon dioxide or nitrogen, supplied to the housing or pressurized chamber **1** by tank **96** and housing inlet **97** to header **47**. Housing **1** is also provided with a pressure balancing vent **98** later described in its top wall. The pressure in housing **1** is for example approximately 4 inches W.G.(water gauge).

In the front wall of the housing there is a loading and unloading doorway **3** for loading and removing the rubber parts from within the housing **1**. As seen better in FIGS. 3–4, the door **5** of the housing **1** is raised and

lowered in tracks by the hoisting mechanism generally indicated at **9** to expose and close off doorway **3**.

The lower portion or closed position portion of tracks **7** curves and extends inwardly from the upper portion or open position of the tracks **7**. With this arrangement, a good tight seal is provided between door **5** and doorway **3** when the door is in the closed position.

Doorway **3** of pressurized housing **1** communicates with air lock chamber **100** which contains the loading and unloading equipment which will be later described. When door **5** is closed to seal housing **1** the operator enters air lock chamber **100** through door **102** and loads the molded rubber or thermoplastic goods into loading bucket **11**. Optionally operator could load and unload through door **102** without entering air lock. The operator then leaves chamber **100** and closes door **102** to seal air lock chamber **100**. Air lock would then be purged replacing the air that entered during the opening of door **102** by means of injecting sufficient quantity of the same gas being supplied to the housing or pressurized chamber by tank **96** and a branch line from pipe **97**. The gas could be supplied, for example, through line **200** (shown in phantom in FIG. 2). Vent damper **202** (shown in phantom in FIG. 2) on air lock **100** would release purged air to atmosphere. As a result when doorway **3** is opened the pressure in housing **1** is substantially unaffected by the pressure of the much smaller chamber **100** and there is no contamination of the room atmosphere. When the rubber pieces are deflashed they are automatically unloaded into air lock chamber **100** as later described and doorway **3** is closed to seal housing **1**. Air lock chamber **100** can then be re-entered to remove the deflashed pieces and load other pieces into bucket **11**.

Loading bucket **11** is pivotally supported on arms **13** which are in turn pivotally supported on a bracket **15** mounted in fixed manner on drive shaft **17**. Drive shaft control **19** rotates the shaft **17** to in turn raise the bracket **15**, the bucket supporting arms **13** and the bucket **11** supported thereby to a position adjacent to the top of the open doorway as described in U.S. Patent No. 3,110,983. A side guide arm **21** pivotally connected to the housing **1** and an arm **13** guides or pulls the bucket **11** inwardly within the doorway **3**. When the bucket is raised to this uppermost position, pressure cylinder **23** connected to the bucket support and the bottom of the bucket **11** is actuated to extend its shaft **25** connected with the bottom of the bucket to tip the bucket whereby the rubber pieces loaded in the bucket will be discharged into the freezing and abrasive treating area. After discharging its load, the piston **25** is then retracted and the drive shaft **17** is rotated in the opposite direction to in turn lower the bracket **15**, the arms **13** and the bucket **11** to its original station as shown in FIGS. 1 and 2. The door **5** opens automatically during the loading operation and is closed during the treating steps. Once the articles are deflashed and ready for unloading, the door **5** is automatically opened again.

The above operation of the bucket loader and door **5** is included as a part of a cycle which is automatically controlled through the control panel **27** affixed to the front face of the housing **1**.

The rubber pieces are received from loading bucket **11** by a trough shaped endless belt type conveyor **29** as shown better in FIG. 4. The conveyor **29** is formed of metal bars or slats (not shown) which extend transversely of the conveyor travel and are connected at their ends to a continuous sprocket chain **33**. The conveyor rotates around a front pair of guide sprockets **35** and a pair of rear drive sprockets **38**. A pair of guide disks **39** are rotatably mounted in side walls **41** which enclose the sides of the conveyor trough area to provide contact with the slats of the upper deck of the conveyer **29** to compel the

conveyor 29 to follow a concave path which resembles a trough laterally inclined so that it faces the doorway 3.

The operation of the conveyor 29 is part of the cycle controlled from a panel 27. The endless conveyor may also be formed of a wire mesh belt instead of the bars or slats described above. The conveyor area also includes a door 46 which is opened automatically through control panel 27 during the loading and unloading operation but which is closed during the freezing and abrasive treatment. Briefly, this door consists of an upper rigid portion having a lower flexible portion. The door 46 is supported by rollers in door tracks 46' which bend inwardly adjacent the bottom of the tracks. Since the lower portion of the door 46 is flexible it follows the curved pathway defined by the lower curved portion of the tracks. The tracks 46' for the door 46 extend upwardly above the roof of the conveyor area to accommodate the door in its opened position. These structural details of the door are better shown in Patent No. 3,048,947; however, other suitable doors can be used.

After the rubber pieces 42 (see FIG. 3) are loaded in the conveyor and before they are trimmed or deflashed, they are treated with a freezing medium 43 which can be liquid carbon dioxide, pulverized Dry Ice or other suitable freezing mediums such as liquid nitrogen. In fact, a combination of liquid carbon dioxide and liquid nitrogen can also be used. The conveyor 29 is in operation during the freezing step whereby the pieces 42 are tumbled and turned to expose all surfaces to the freezing action.

The freezing medium used is supplied by tank 97 to the nozzles 45 by a common header 47 extending through and supported by the side walls 41 enclosing the conveyor area.

Again, the application of the freezing medium 43 to the work pieces 42 occurs in a definitely timed cycle controlled by or through control panel 27.

In the freezing operation, the rubber pieces 42 are differentially frozen. This means that the excess trimming, flashing, etc. is frozen to a brittle state while the thicker portions of the rubber pieces are not completely frozen and therefore still retain some of their resiliency. With this arrangement, the brittle thin flashings are easily removed by the abrasive action whereas the thicker portions of the pieces are not damaged or otherwise abused by the abrasive action. The duration of the freezing step of the cycle will vary for different size of type of rubber pieces being treated.

After the rubber pieces have been differentially frozen in the manner explained above, they are then exposed to the next step of the cycle which is the abrasive treating cycle. As shown in FIG. 4 a rotary wheel 50 is supported in a housing 52 attached to the roof-top or wall 44 which joins the side walls 41 of the conveyor area to cover the top of the conveyor area. The wheel 50 is rotated at high speed by a motor to propel abrasive media such as fine steel shot through an opening in the roof top 44 and against the frozen rubber pieces supported in the trough shaped conveyor. During the abrasive applying step, a plug is automatically withdrawn from the opening. A baffle plate extending horizontally from the freezing medium supply header 47 prevents abrasive from striking the header 47. The abrasive media is supplied to the blasting wheel 50 through storage bin 56 connected by passageway 57 to the wheel itself.

For further detailed description of the rotary blast wheel itself, reference is made, for instance, to Patent Nos. 2,869,289; 2,732,666 and 3,197,920. Any type of wheel assembly may be used however.

It should be noted, as mentioned above, that during both the freezing step and the abrasive action step, the sprockets 35 and 38 are driven by a suitable motor drive mounted externally of the side walls 41 which enclose the conveyor area. This action causes the rubber pieces to tumble, rotate and otherwise change position whereby all surfaces of the pieces 42 are adequately exposed or subjected to both the freezing and abrasive treatment.

After the abrasive action has ceased, both the outer door 5 and the inner door 46 are automatically raised to open position. The direction of travel of the conveyor 29 is reversed and as seen in FIG. 4 the rubber drops onto a slide plate 60 and are ultimately removed.

The abrasive and trim or flash that has been removed from the rubber pieces 42 in the trough conveyor 29 drops through the slats which make up the conveyor 29 and onto a screen slide or chute 70 (FIG. 4) which permits only the abrasive and finer pieces of flashing to pass. This abrasive drops onto a screen conveyor (not shown) or other conveying means and is fed to a scalping drum 72. In the scalping drum, the abrasive is further refined from the removed trim or flash with the flash discharged through a refuse discharge and into a collection box which can be removed and emptied by the user. The specific structure of the scalping drum is described in Patent Nos. 2,771,189 and 3,087,615. From the scalping drum 72, the abrasive from which the larger pieces of trim or flash have been removed is passed into an elevator 75 which raises the abrasive upwardly to a separator 77 of an air wash type. Here, the abrasive passes through a stream of air whereby the fins and other light-weight contamination are removed. The specific structure of the separator can be shown in Patent No. 2,771,189.

From the separator 77, the abrasive then passes down into the storage bin 56 for the abrasive from which it passes through conduit 57 to the abrasive wheel 50. As an alternate abrasive can be branched off from the storage bin through a feed pipe 83, by-passing the blast wheel, feeding to screw conveyor 72 for recirculation through the entire abrasive cleaning system.

The air in housing 1 is filtered by dust collector 81 which is external of housing 1 but communicates with it through pipes 90 and 79. Dust collector 81 is of the type shown in Patent Nos. 3,053,031; 2,667,233; and 2,876,-862. The air from housing 1 is drawn through pipe 90 into dust collector 81 by fan 87 mounted on the top of dust collector 81. The dust laden air is filtered through a series of dust bags (not shown) and the air is discharged through pipe 79 back into housing 1. Dust collector 81 thereby completely recirculates the air in housing 1 and, although it is mounted external of housing 1, the pressure within housing 1 is substantially unaffected by dust collector 81. Because housing 1 is appreciably reduced in size, due to the external mounting of dust collector 81, the cost of maintaining the proper pressure and temperature conditions in it is also greatly reduced.

Advantageously the same refrigerant 43 in liquid form for freezing the work load is also used to gaseous form for pressurizing housing 1. Thus the atmosphere of housing 1 is essentially 100% pure refrigerant. The added gaseous refrigerant resulting from the vaporization or sublimation of the liquid refrigerant used for freezing the work load, is discharged from vent 98 into line 103 to recondenser 105. Recondenser 105 is generally of the closed cycle gas refrigerator type wherein a sufficiently low temperature is generated to recondense the vented gas back to liquid form where it is returned to supply tank 96 through line 107 for subsequent reuse. This utilization of what would otherwise have been waste gas, considerably reduces operating costs.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. Apparatus for deflashing molded goods comprising a gas pressurized chamber, pressure means connected to said chamber, deflashing means in said chamber, air locking means connected to said chamber, dust collecting means positioned externally of and communicating with said chamber for removing dust-contaminated gas from said chamber, and gas return means connecting said dust

collecting means to said pressurized chamber for recirculating filtered gas back to said chamber.

2. The apparatus of claim 1 wherein loading means are in said air locking means for loading and unloading said molded goods into and from said deflashing means in said chamber, said air locking means including means for opening and closing communication of said air locking means with said pressurized chamber.

3. The apparatus of claim 2 wherein automatic control means are connected to said loading means for operating said loading means externally of said air locking means.

4. The apparatus of claim 2 wherein said deflashing means includes liquid refrigerant applying means for differentially freezing said molded goods, and the gas for maintaining said chamber pressurized being the gaseous form of said refrigerant.

5. The apparatus of claim 4 wherein said pressure means includes a supply of said liquid refrigerant, and said pressure means communicating with said deflashing means for feeding liquid refrigerant to said deflashing means.

6. The apparatus of claim 5 wherein vent means are on said chamber for discharging excess gaseous refrigerant, recondenser means being connected to said vent means for liquifying said excess gaseous refrigerant, and said recondenser means being connected to said pressure means for recirculating said excess refrigerant back to said chamber.

7. Apparatus for deflashing molded goods comprising a gas pressurized chamber, pressure means connected to said chamber, deflashing means in said chamber, an air locking chamber, means for opening and closing communication of said air locking chamber with said pressurized chamber, and loading means in said air locking chamber for loading and unloading molded goods into and from said deflashing means.

8. The apparatus of claim 7 wherein said deflashing means includes liquid refrigerant applying means for differentially freezing said molded goods, and the gas for maintaining said chamber pressurized being the gaseous form of said refrigerant.

9. The apparatus of claim 8 wherein said pressure means includes a supply of said liquid refrigerant, and said pressure means communicating with said deflashing means for feeding liquid refrigerant to said deflashing means.

10. The apparatus of claim 9 wherein vent means are on said chamber for discharging excess gaseous refrigerant, recondenser means being connected to said vent means for liquifying said excess gaseous refrigerant, and said recondenser means being connected to said pressure means for recirculating said excess refrigerant back to said chamber.

11. Apparatus for deflashing molded goods comprising a gas pressurized chamber, pressure means connected to said chamber, deflashing means in said chamber, dust collecting means positioned externally of and in communication with said chamber for removing dust-contaminated gas from said chamber, and gas return means connecting said dust collecting means to said chamber for recirculating filtered gas back to said chamber.

12. The apparatus of claim 11 wherein said deflashing means includes liquid refrigerant applying means for differentially freezing said molded goods, and the gas for maintaining said chamber pressurized being the gaseous form of said refrigerant.

13. The apparatus of claim 12 wherein said pressure means includes a supply of said liquid refrigerant, and said pressure means communicating with said deflashing means for feeding liquid refrigerant to said deflashing means.

14. The apparatus of claim 13 wherein vent means are on said chamber for discharging excess gaseous refrigerant, recondenser means being connected to said vent means for liquifying said excess gaseous refrigerant, and said recondenser means being connected to said pressure means for recirculating said excess refrigerant back to said chamber.

15. Apparatus for deflashing molded goods comprising a gas pressurized chamber, air locking means connected to said chamber, pressure means connected to said chamber, said pressure means including a supply of liquid refrigerant, deflashing means in said chamber, said deflashing means including abrasive blasting means and means for applying liquid refrigerant from said pressure means against said molded goods to differentially freeze said molded goods, the gas for maintaining said chamber pressurized being the gaseous form of said refrigerant, vent means being on said chamber for discharging excess gaseous refrigerant, recondenser means being connected to said vent means for liquifying said excess gaseous refrigerant, and said recondenser means being connected to said vent means for liquifying said excess gaseous refrigerant, and said recondenser means being connected to said pressure means for recirculating said excess refrigerant back to said chamber.

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