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AIR CONDITIONING APPARATUS

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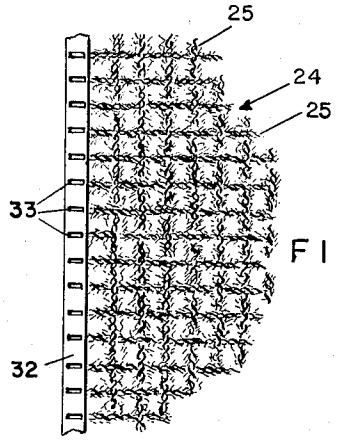

FIG. 2

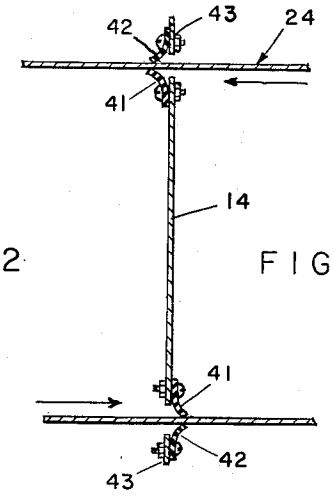

FIG. 3

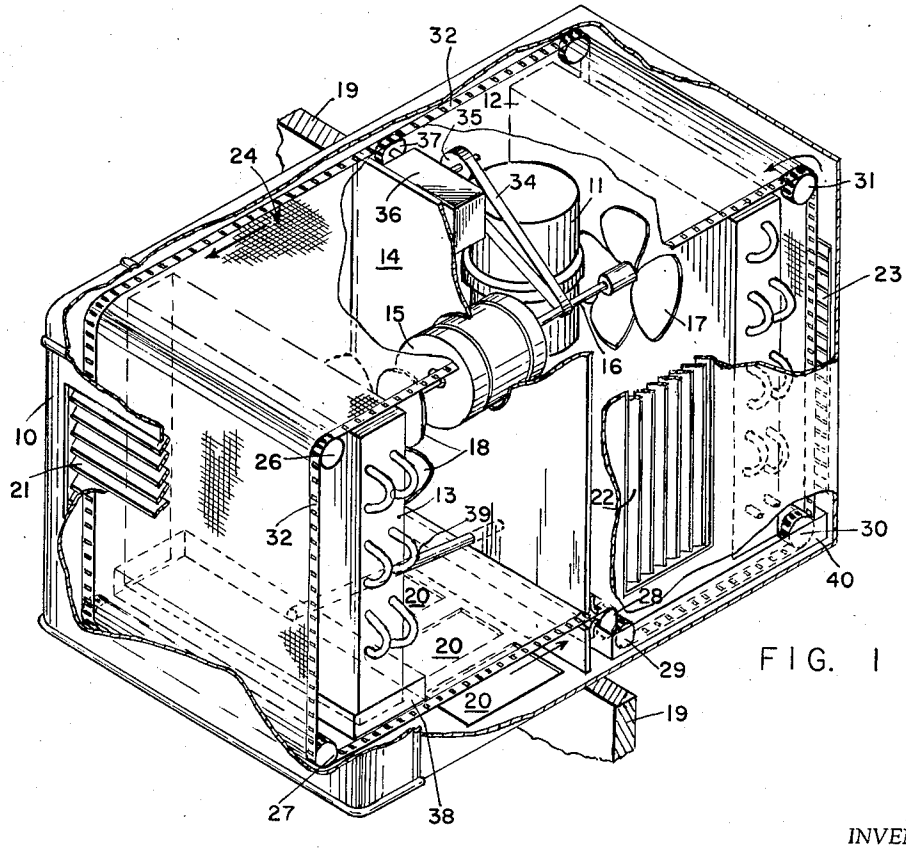

FIG. 1

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AIR CONDITIONING APPARATUS

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5 Claims. (Cl. 62—78)

This invention relates to air conditioning and more particularly to a combination odor absorbing, air filtering and condensate disposing construction and method for use in an air conditioner.

In the use of an air conditioner, it is necessary to dispose of the condensate which accumulates as a result of the normal operation of the air conditioner. It is also desirable to both absorb the odors from and filter air which is being recirculated. In the past individual pieces of equipment, such as air filters and condensate disposers, have been appended to the air conditioner to perform each of these functions independently of each other. This was inherently costly and made the air conditioning unit cumbersome and bulky. Furthermore, insofar as we are aware, most odor absorbing equipment which has been used in air conditioners in the past was of the type which absorbed a certain amount of odors and then became saturated. This necessitated removing the odor absorbing equipment from the air conditioning equipment and replacing it, as required. This procedure was both costly and inconvenient. It is with the overcoming of the foregoing shortcomings that the present invention is concerned.

It is therefore the main object of this invention to provide in combination with an air conditioner an improved construction which will both filter and deodorize contaminated air.

It is another object of this invention to provide a construction for an air conditioner which in addition to accomplishing the foregoing objects will also dispose of the condensate which accumulates in an air conditioner.

A still further object of this invention is to provide apparatus for filtering and deodorizing contaminated air which can be used indefinitely in that it is automatically regenerated and cleaned during operation of the air conditioner. Other objects and attendant advantages of the present invention will readily be perceived hereafter.

The present invention relates to apparatus and a method for absorbing odors from and filtering contaminated air and disposing of condensate in an air conditioner. A flexible belt of odor absorbing material is caused to travel proximate to both the evaporator and condenser of the air conditioner. During its travel proximate the evaporator the odor absorbing belt is cooled. This makes it more absorbent to odors. Room air is caused to pass through the cooled belt whereby the odors in the air are absorbed by the belt. Foreign particles such as dust, dirt, lint and the like are also trapped in the belt as the air passes through it. The cooled belt then passes through a condensate drain pan where it picks up condensate which is produced during operation of the air conditioner. Further travel of the belt causes it to pass into proximity with the condenser of the air conditioner. Outside air, which is forced through the condenser for cooling the latter, is thus heated and is caused to pass through the odor absorbing belt. The combination of air passing through the belt and the heat of this air desorbs the odors in the belt. Furthermore, the passage of air through the belt

also causes the entrapped foreign particles on the belt to be blown from the belt. The heated condenser cooling air also causes the condensate which is held by the belt to be evaporated. The cleaned, deodorized belt is then caused to pass in proximity with the evaporator and the foregoing described cycle is then repeated. The present invention will be more fully understood when the following portions of the specification are read in conjunction with the accompanying drawings wherein:

Figure 1 is an isometric view of a room air conditioner with certain parts broken away in order to show the structure of the present invention;

Figure 2 is a greatly enlarged view of a portion of the flexible odor absorbing belt; and

Figure 3 is a detail view, in cross-section, of the partition which divides the evaporator and condenser chambers of the air conditioner.

In Figure 1 an air conditioner of the room type is shown with certain portions of the casing **10** broken away in the interest of clarity. Suitably mounted in casing **10** are motor compressor unit **11**, a condenser coil **12** and an evaporator coil **13**. An expansion member, such as a capillary or expansion valve (not shown), is provided between the condenser **12** and evaporator **13**. The refrigerant carrying conduits linking elements **11**, **12** and **13** have been omitted from the drawing for the sake of clarity. However, it is to be understood that the refrigeration circuit of the air conditioner is conventional.

Casing **10** is divided by partition **14** into an evaporator chamber (not numbered) which houses the evaporator **13** and into a condenser chamber (not numbered) which houses condenser **12**. Mounted in partition **14** is a motor **15** having a double ended shaft **16**. Condenser fan **17** is mounted on one end of shaft **16** and evaporator fan **18** is mounted on the other end of shaft **16**.

The casing **10** is mounted in a wall **19** or window. The portion of the unit containing the evaporator chamber may project substantially within the room to be conditioned and the portion of the unit containing the condenser chamber substantially projects in the out-of-doors, as is well known in the art.

During operation of the air conditioner, room air is induced into the evaporator chamber through apertures **20** in the bottom of casing **10** or through any other suitable apertures. This air is then forced through evaporator **13**, where it is cooled, and the cooled air is discharged through louvers **21** into the room. Condenser cooling air is induced into the condenser chamber by fan **17** through louver **22**. Fan **17** then forces this air through condenser **12** for cooling the condenser. Because of this heat exchange the condenser cooling air is heated. This air is then discharged to the out-of-doors through louvers **23** in casing **10**.

In addition to cooling air in the above described manner, it is necessary to dispose of condensate which forms during the operation of the air conditioner. It is also desirable to deodorize the room air which is being recirculated in the above described manner. In addition to the foregoing it is also desirable to filter the air which is being recirculated by removing foreign particles such as dust, dirt, lint and the like therefrom. A highly simplified inexpensive construction is utilized to accomplish all of the foregoing objectives, as described in detail hereafter.

An endless belt **24** is provided. This belt (Figures 1 and 2) is made of a fine fibrous material knitted into a coarsely woven mesh, the primary objective being that this belt will have a large amount of surface area which will permit the absorption of odors without causing too great a pressure drop. This belt may be made of poly acrylimide or any other suitable type of material. It is also within the contemplation of this invention that

the belt may consist of a loose weave of heat resistent material, or a very open "paper" made of asbestos fibers, which has been impregnated with an odor absorbing material such as activated charcoal. In the latter embodiment the activated charcoal may be applied to the asbestos fiber belt, the latter being impregnated with a plastic which holds the charcoal to the fiber belt. It is also within the contemplation of this invention that other liquid or solid odor absorbers may be applied to belts made of other materials. In Figure 2 the embodiment is shown wherein a fine fibrous material is twisted into strands **25** and then woven into a coarsely woven mesh which will permit air to pass through belt **24** without causing too great a pressure drop.

Rollers **26**, **27**, **28**, **29**, **30** and **31** are suitably mounted for rotation in casing **10**. (This rotating structure has been omitted from the drawing in the interest of simplicity.) Sprockets (not numbered) are provided at each end of each of the foregoing rollers, As can be seen from Figure 1 endless belt **24** is adapted to pass over all of the foregoing rollers with track **32** at the margins of the belt containing apertures **33** mating with the above-mentioned sprockets. Belt **24** is driven in the following manner: A belt **34** couples shaft **16** to pulley **35** of the gear reducer **36**. The sprocket **37** of gear reducer **36** engages track **32** for driving belt **24**. It will thus be seen that when fan motor **15** is in operation, belt **24** will be caused to travel around the rollers on which it is mounted.

As noted above, during operation of the air conditioner, condensate will form on evaporator coil **13**. As this condensate builds up it will drip into condensate receiving pan **38** which is mounted below the evaporator. A tube **39** conducts this condensate into pan **40**, which is located in the condenser compartment, where the condensate is picked up by belt **24** in a manner to be described hereafter.

It is to be noted at this point that it is desirable to keep communication of air within the evaporator and condenser chambers to a minimum. To aid in accomplishing this, resilient strips **41** are suitably affixed to partition **14** (Figure 3). Similar resilient strips **42** are suitably affixed to brackets **43** which depend from the inside surfaces of casing **10**. The foregoing construction effectively permits passage of belt **24** through partition **14** while minimizing the amount of air passing between the evaporator and condenser chambers.

The combined condensate disposing, air filtering and deodorizing apparatus of the present invention operates in the following manner: As belt **24** passes across the front face of evaporator **13**, the air, which is cooled by the evaporator, tends to cool the belt **24**. The belt, being cool, will therefore tend to absorb odors from the air which passes through it. Continued movement of the belt will bring the cooled portion in the path of air which is induced through openings **20** in the bottom of casing **10**. This belt is still cool because of its previous travel near the evaporator **13** and tends to again absorb odors when it is near openings **20**. Thus air which is recirculated by the air conditioning unit passes through belt **24** twice so that the cooled portion of the belt has two chances to absorb odors from the air which is being circulated by the air conditioner. Furthermore, it will be noted that the air coming up through apertures **20** impinges first on the outside surface of belt **24**. Since this belt consists of a twisted loosely woven mesh, foreign particles in the air, such as dirt, dust, lint, etc., will tend to be trapped on the outer surface of belt **24**. As noted above, the belt continually travels because of the driving mechanism associated with fan motor **15**. Continued movement of belt **24** will cause it to pass through lower sealing structure **41**, **42** around rollers **28** and **29** and into condensate pan **40**. The washing action of the condensate in pan **40** will tend to remove the lint, dirt and dust which has been trapped on the outer surface of belt **24**. These foreign particles will then settle to the bottom of pan **40** and means may be provided for periodically removing pan **40** for cleaning. The belt then moves around roller **30** and across the face of condenser **12**. As explained above, fan **17** forces outside cooling air across condenser **12**. This air is heated because of its passage through condenser **12**. The heated air then passes through the portion of belt **24** which is then positioned in front of the condenser **12**. The heated air will heat belt **24** and cause the odors contained therein to be desorbed, it being appreciated that the heating of a substance containing odors will tend to drive the odors from this substance. The desorbing is accomplished because of two factors. The first factor is the heating, as previously mentioned, and the second factor is the washing or scrubbing action of the air passing through belt **24**. It will further be noted that any remaining foreign particles which were previously trapped on the outside surface of belt **24** will be blown off of the belt because of the condenser cooling air passing therethrough. Furthermore, the condensate from pan **40** which has been absorbed by belt **24** will be evaporated by the hot air passing through the belt. The removal of moisture from the belt in this manner not only disposes of the condensate but also aids in the desorbing process because the evaporating water will tend to carry odors with it. As the belt **24** passes around roller **31** in the direction of the arrow, it will have been desorbed of odors, cleaned, and will be in a dry condition. As the belt moves between rollers **31** and **26**, it will gradually cool down so that when it again passes across the face of evaporator **13** it will be at a relatively low temperature. The foregoing cycle is then repeated.

It will thus be seen that we have provided an air conditioner with a combination condensate disposer, deodorizer and air filter. It can readily be seen that the belt **24** which acts as both a deodorizer and filter is self cleaning in that the foreign particles which are picked up by it at one point of its travel are disposed of at another point of its travel. It can also readily be seen that the belt having absorbed odors in the cool portion of the air conditioner is itself desorbed in the warm portion of the air conditioner. Thus, there is a regeneration process which is effected by taking advantage of the inherent differences in temperature between the various portions of an air conditioner. It will be further noted that there is a definite interaction between the three functions of the belt **24**. More specifically, the condensate in pan **40** helps to wash belt **24** by removing foreign particles therefrom. Furthermore, the evaporation of the condensate from belt **40** in the condenser zone tends to carry the odors from the belt. It will thus be seen that the combined air filtering and deodorizing and condensate removing construction of the present invention efficiently and economically improves the operation of an air conditioner.

While we have described the preferred embodiment of our invention, we desire it to be understood that it may be otherwise embodied within the scope of the following claims:

We claim:

1. In a self-contained air conditioning unit, the combination of a casing, a partition separating said casing into a first compartment and a second compartment, a refrigeration system including an evaporator placed in the first compartment and a condenser placed in the second compartment, a fan in the first compartment to pass air through said evaporator, a fan in said second compartment for passing air through said condenser, a condensate pan in said second compartment, an endless flexible odor-absorbing belt mounted in said casing, means to rotate said belt, said belt being mounted to pass adjacent said evaporator to cool the belt, through the condensate pan to absorb condensate and adjacent

the condenser to heat the belt so that upon rotation of the belt the evaporator fan passes contaminated air through the cooled portion of the belt thus absorbing odors therein and filtering foreign particles from the air and trapping the particles in the belt, the belt then passing through the condensate pan to wash foreign particles therefrom and to absorb condensate, the condenser fan then passing heated air through the belt to desorb the belt and to remove moisture therefrom.

2. A self-contained air conditioning unit according to claim 1 in which the first compartment includes an inlet so disposed that contaminated air drawn into the compartment passes through the belt during ts passage from a position adjacent the evaporator to the condensate pan so that the contaminated air passes through the belt, then through the evaporator and again through the belt.

3. A self-contained air conditioning unit according to claim 1 in which the partition includes openings for the passage of the belt therethrough and seal means adjacent said openings to substantially prevent movement of air from one compartment to the other compartment through said openings.

4. A self-contained air conditioning unit according to claim 3 in which the means for rotating the belt are driven from a motor driving the fans.

5. In a method of deodorizing and filtering foreign particles from an air stream directed through a self-contained air conditioning unit including an evaporator and a condenser, the steps which consist in passing an odor-absorbing and filtering member adjacent the evaporator to cool the same, simultaneously interposing said member in the air stream to deodorize and filter the air stream, passing said member through a pool of condensate to absorb the same and to remove foreign particles from the member, then passing said member adjacent the condenser to heat the same while simultaneously placing said member in a stream of heated air from the condenser to deodorize the member, to remove condensate therefrom and to remove remaining foreign particles from the member, and repeating the cycle.

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