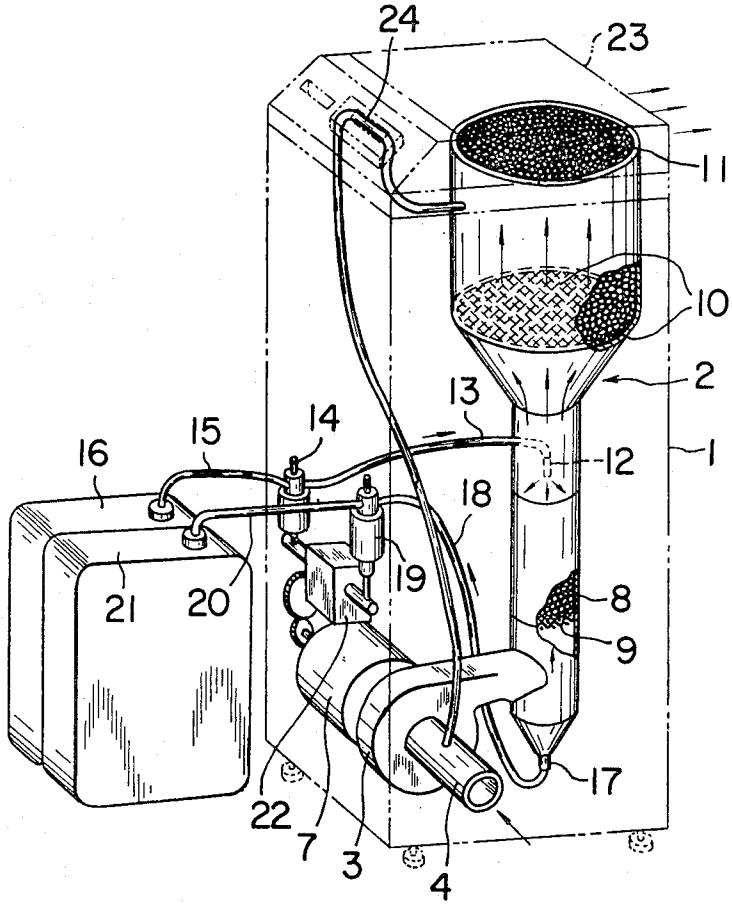
July 25, 1972 HIDEO HASHIMOTO ET AL 3,679,369

DEODORIZATION DEVICE

Filed May 11, 1970 3 Sheets-Sheet 1

Fig. 1




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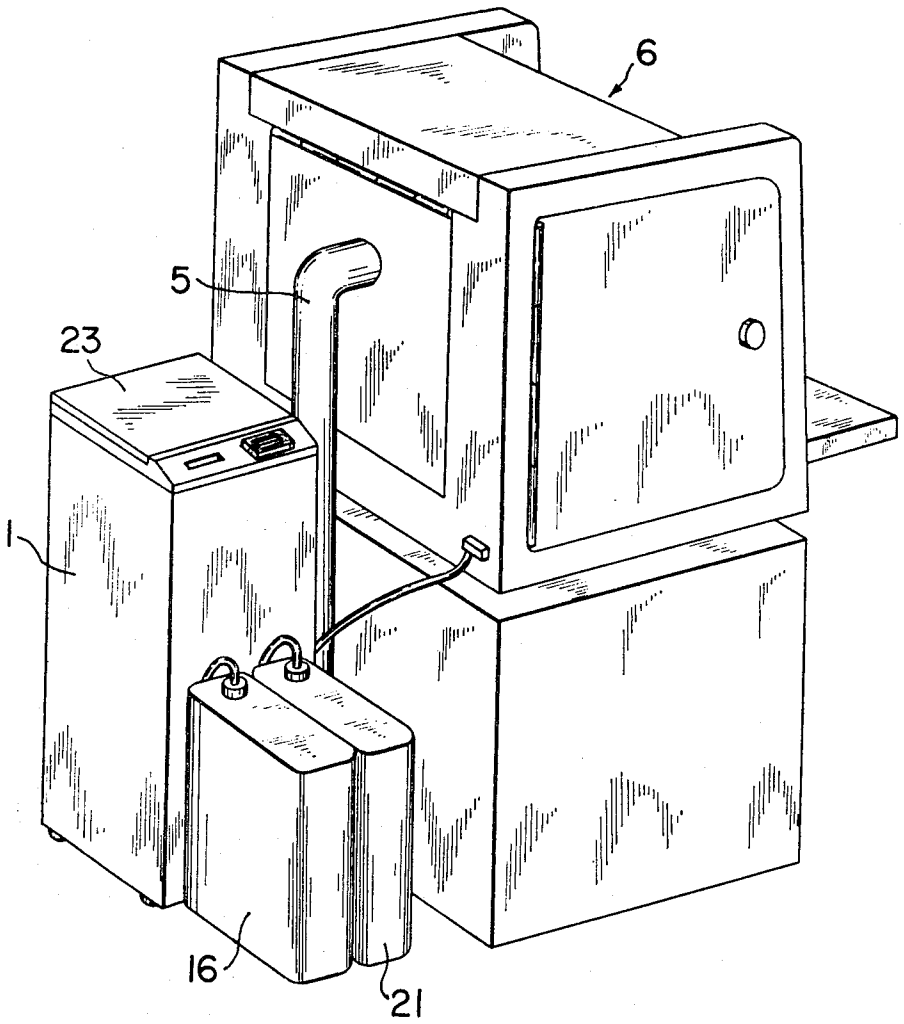
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DEODORIZATION DEVICE

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Fig. 2




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DEODORIZATION DEVICE

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Fig. 3

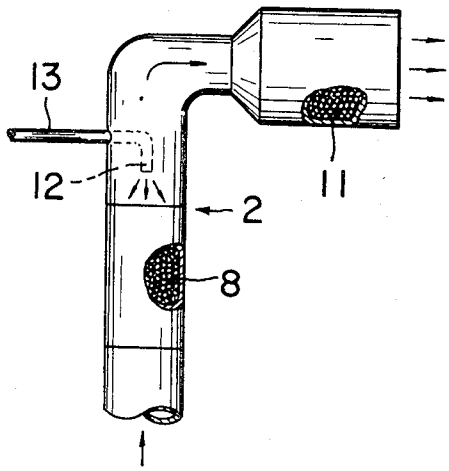
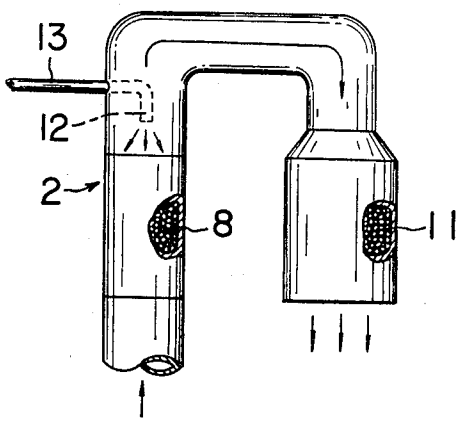



Fig. 4




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3,679,369

# DEODORIZATION DEVICE

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U.S. Cl. 23—284 3 Claims

## ABSTRACT OF THE DISCLOSURE

A deodorization device particularly adapted for use with ammonia process diazo copying machines includes an odor removing conduit having two odor removing sections, through which ammonia containing exhausts are caused to flow. A filler is provided in the first odor removing section, a deodorizing chemical being applied to the filler, while an ammonia adsorbent is provided in the second odor removing section, the ammonia containing exhausts flowing first through the first section and then through the second section.

This invention relates to deodorization devices for use particularly with ammonia process diazo copying machines. As is well known, ammonia gas is used with ammonia process diazo copying machines for developing exposed sheets. All the ammonia gas supplied to the developing section is not used for developing purposes but part of the gas leaks out of the developing section into other sections of the machine and out of the machine. Ammonia gas gives off an offensive smell and has deleterious effects on human beings. If ammonia gas leaks out of the copying machine into the operation chamber, it will be injurious to the health of the operator and markedly reduce operation efficiency. In order to obviate this problem, means are provided in ammonia process diazo copying machines for removing ammonia gas in the machine and forcibly venting the same to atmosphere outside the operation chamber. However, the provision of such venting system has disadvantages in that an additional cost is involved in providing the venting system and an extra space is required for mounting such system, thereby the place for installing the copying machine being strictly restricted.

The present invention has as its object the provision of a deodorization device which obviates the aforementioned disadvantages of the prior art deodorization system for ammonia process diazo copying machines and permits to effect deodorization economically and positively without requiring to install a particular venting system.

According to the present invention, there is provided a deodorization device where in a filler and an ammonia adsorbent are mounted in the indicated order in a deodorization passageway through which ammonia gas containing exhausts are vented from the copying machine, said filler being disposed nearer to the source of exhausts than said ammonia absorbent and said filler being sprayed with a deodorant. By this arrangement, over 90% of the odor caused by ammonia gas contained in the exhausts is removed by the deodorant in the filler. This is effective to lessen the burden imposed on the adsorbent and cause the rest of the odor to be removed by the adsorbent, so that deodorization of exhausts by removing ammonia gas can be satisfactorily carried out. An added advantage lies in the fact that the adsorbent used may be one which is not costly, thereby permitting to economize on operation costs of the machine. The filler and the chemical applied to the



filler are relatively low in cost. Distinct advantages can be had if an odor removing conduit is provided perpendicularly and the filler is mounted in the lower portion of the conduit and the ammonia adsorbent is mounted in the upper portion of the conduit, so that ammonia containing exhausts are led upwardly from the lower end of the conduit to the upper end thereof. This arrangement is particularly advantageous in that the chemical for removing odor can be applied uniformly from above to the filler so that stream of chemical moving downwardly through the filler and the stream of exhausts moving upwardly through the filler may form countercurrent, thereby permitting to achieve excellent results in removing odor. According to the present invention, a ventilator may be connected to the inlet and/or outlet of the odor removing conduit so that a motor for driving the ventilator may also operate a chemical supply pump and, if necessary, a chemical discharge pump. This arrangement facilitates the passing of the exhausts through the odor removing conduit and permits to vent exhausts with increased efficiency. Besides, the supply and discharge of the chemical are facilitated, with a result that deodorization of the exhausts can be effected satisfactorily.

Additional objects as well as features and advantages of the invention will become evident from the description set forth hereinafter when considered in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of the deodorization device according to this invention, with the casing for housing the device therein being partly broken away to show the interior;

FIG. 2 is a perspective view of the deodorization device according to this invention connected to a copying machine; and

FIGS. 3 and 4 show other examples of arrangement of the odor removing conduit of the deodorization device according to this invention.

In FIG. 1, an odor removing conduit **2** is disposed perpendicularly in a casing **1** of the deodorizing device. A fan **3** is connected on its delivery side to the inlet of the odor removing conduit **2** at the lower end thereof and on its suction side **4** to a copying machine **6** through a connecting line **5** (see FIG. 2). **7** is a motor for operating the fan **3**.

The odor removing conduit **2** consists of two portions or a lower minor dimension portion and an upper major dimension portion. A filler **8** arranged on a support, for example a net **9**, is mounted in the lower minor dimension portion, and an absorbent **11** arranged on a support, for example a net **10**, is mounted in the upper major dimension portion. Arranged above the filler **8** in the odor removing conduit **2** is a nozzle **12** which is connected by a line **13** to a chemical supply pump **14** which in turn is connected by a line **15** to a chemical supply tank **16**. Disposed at the lower end of the odor removing conduit **2** is a drain port **17** which is connected by a line **18** to a waste chemical discharge pump **19** which in turn is connected by a line **20** to a waste chemical tank **21** disposed adjacent a chemical supply tank **16**.

The motor **7** for operating the fan **3** comprises a shaft which is connected, at an end opposite to the end at which the shaft is connected to the fan **3**, to a speed reducing means **22** for operating the chemical supply pump **14** and waste chemical discharge pump **19**. Provided on the top of the casing **1** is a cover **23** on which a warning device **24** for measuring the degree of saturation of the absorbent **11** and giving warning is provided. The warning device is connected, on one hand, to the absorbent **11** by a line and, on the other hand, to the suction side of the fan **3** by a line. The operation of the deodorization device constructed as aforementioned will now be explained. Am-

monia containing exhausts are vented from the copying machine **6** and sent through the connecting line **5** to the suction side **4** of the fan **3** which delivers the exhausts to the lower portion of the odor removing conduit **2**. The exhausts move upwardly from the lower portion and pass through the filler **8** which consists of glass beads **3** millimeters in diameter, particles of pumice-stone 5 to 7 millimeters in diameter or other material having a large surface area and high chemical resistance. The chemical contained in the supply tank **16** is delivered by the supply pump **14** and applied uniformly to the filler **8** through the nozzle **12**. The chemical applied to the filler in this way move downwardly through the filler in an orderly manner. The chemical used for this purpose may be a solution of one or more substances which readily react with ammonia gas and are highly soluble in water, such as a 5 to 10% aqueous solution of aldehydes which readily react with ammonia, or an aqueous solution of mineral acids, organic acids and the like, such as a 5 to 20% aqueous solution of acetic acid.

Accordingly, the majority of ammonia gas in the exhausts moving upwardly through the odor removing conduit **2** reacts with the chemical in the filler **8** and has its odor removed, so that the exhausts reaching the adsorbent **11** in the upper portion of the conduit **2** have had their odor substantially removed. The chemical that has reacted with ammonia gas is led through the drain port **17**, line **18**, discharge pump **19** and line **20** to the waste chemical tank **21**.

The exhausts that have had the majority of ammonia gas content removed by the chemical in the filler **8** are led through the adsorbent **11** where the rest of the ammonia is completely removed from the exhausts. The exhausts that have had their odor completely removed are vented out of the casing of the deodorization device through the sides and backside of the cover **23**. The adsorbent **11** is an acidic or basic deodorant capable of adsorbing odor components. For example, a porous amphoteric ion exchange resin in which acidic and basic group are exchangeable groups, such as one of ion exchangers made by condensing aromatic amines, for example m-phenylene-diamine, and phenols with formaldehyde, may be used in pellet, particle or sphere form with a diameter of about 3 to 5 millimeters. If the adsorbent **11** is placed in a non-sealing bag such as a gauze bag, the replacing of the old absorbent **11** with a fresh one can be effected with ease merely by opening the cover **23**.

It should be noted that the chemical applied through the nozzle **12** and the ammonia gas contained in the exhausts form countercurrents in the filler. By this arrangement, the portion of chemical that has already reacted with ammonia gas to a certain degree comes into contact with ammonia gas of high concentration in the lower portion of the filler **8** and further reacts with it and then the ammonia gas which has now lower concentration is brought into contact with a fresh supply of chemical in the upper portion of the filler **8** and further reacts with it. Thus, the chemical reacts with the ammonia gas in the exhausts uniformly in the entire area of the filler **8** so that odor can be removed satisfactorily from the exhausts.

FIG. 3 shows a modification of the device of FIG. 1 in which the odor removing conduit **2** is bent at an angle of 90° so that the adsorbent **11** is disposed in a horizontal position.

In still another modification shown in FIG. 4, the odor removing conduit **2** is bent at an angle of 180° into an inverted U-shape, with the adsorbent **11** being arranged in a vertical position in which it faces downwardly.



The odor removing conduit **2** may be arranged in any of the forms shown and described above depending on the manner in which the exit of the odor removing conduit is arranged.

The deodorization device according to this invention can be built in the copying machine to form a part thereof. This permits to reduce the space required for installing the device.

What we claim is:

**1.** A self-contained deodorizing device (**1**) particularly adapted for use with ammonia process copying machines (**6**) having an external line (**5**) for exhausting an ammonia containing stream, said device comprising a casing (**1**) connectable by means of a suction line (**4**) to said exhausting line (**5**) and enclosing an ammonia removing conduit (**2**) containing in succession a filler (**8**) comprising a body of inert particulate filler material and a support (**9**) for said filler, means (**12**) for applying throughout said body of filler material a chemical for deodorizing an ammonia containing stream, an ammonia absorbent (**11**) and a support (**10**) for said absorbent above said applying means; said casing (**1**) having a gas discharge means (**23**) and also enclosing means (**3**) for connecting said suction line to said conduit, means (**3, 7**) for driving through said succession of the filler, the applying means and the absorbent contained in said conduit the ammonia containing stream passing through said suction line; a tank (**16**) for fresh deodorizing chemical, a tank (**21**) for waste deodorizing chemical, a drain port (**17**) at the lowermost end of said conduit for collecting waste deodorizing chemical, a first pump means (**14**) in said casing connecting the fresh chemical tank to said applying means, means (**7, 22**) for driving said first pump means for transferring fresh deodorizing chemical from said fresh chemical tank to said applying means, a second pump means (**19**) in said casing connecting said drain port to said waste chemical tank, and means (**7, 22**) for driving said second pump for delivering waste chemical from said drain port to said waste tank.

**2.** A self-contained deodorizing device as in claim **1** including a warning device means (**24**) for measuring the degree of saturation of the ammonia absorbent (**11**).

**3.** A self-contained deodorizing device as in claim **1** including a warning device means (**24**) connected to the casing (**2**) above the ammonia absorbent (**11**) and connected to said suction line (**4**) for measuring the degree of saturation of said ammonia absorbent (**11**).


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U.S. Cl. X.R.

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