Dec. 10, 1940. H. L. GALSON 2,224,221

GAS AND LIQUID CONTACT APPARATUS

Filed June 7, 1939

Fig. 1.

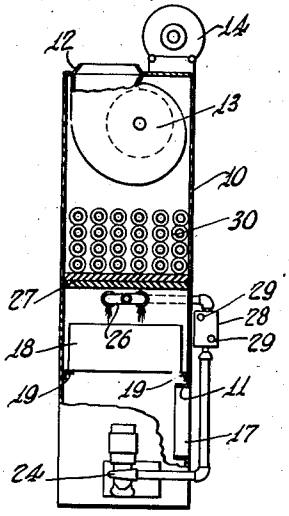


Fig. 2.

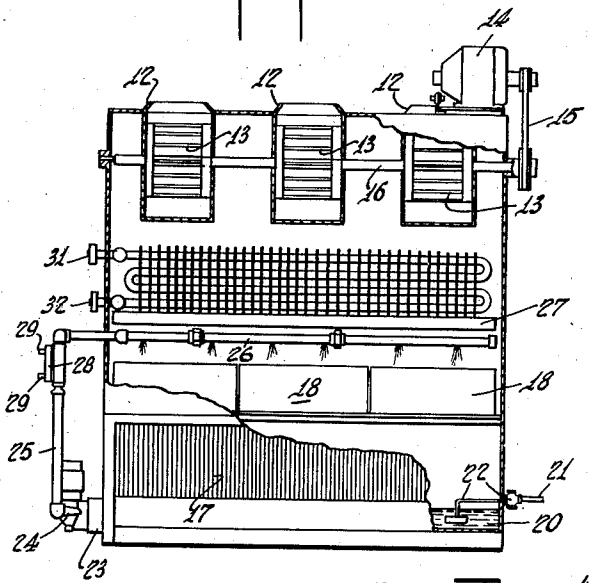


Fig. 3.

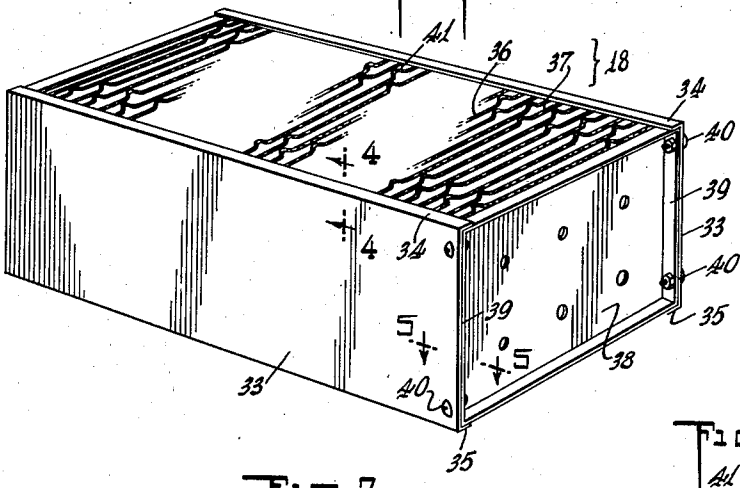


Fig. 4.

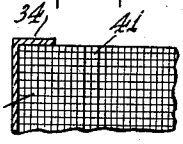


Fig. 5.

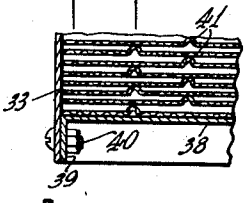


Fig. 6.

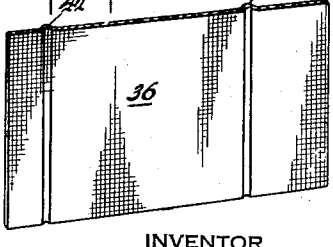
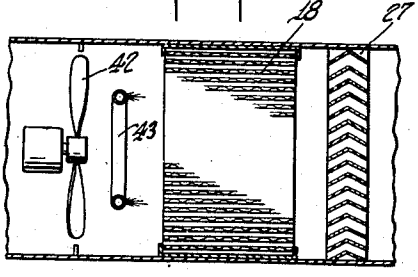


Fig. 7.



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GAS AND LIQUID CONTACT APPARATUS

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Application June 7, 1939, Serial No. 277,898

3 Claims. (Cl. 261—103)

This invention relates to the conditioning of air or other gases, and more particularly to gas and liquid contact apparatus.

The general object of the invention is to provide an improved gas and liquid contact apparatus capable of effecting efficient humidification of a stream of air or other gas passed therethrough.

It is another object of the invention to provide an improved gas and liquid contact apparatus which offers relatively little resistance to the flow of air therethrough, and which is adapted to effect removal of dirt particles and other foreign matter from the air.

It is another object of the invention to provide an improved gas and liquid contact apparatus suitable for humidifying and similar purposes, in which liquid to be evaporated is spread over a relatively large surface from which it is evaporated into the stream of gas passing through the apparatus proximate such surface, the flow of gas through the apparatus being substantially unimpeded.

It is another object of the invention to provide an improved gas and liquid contact apparatus particularly well suited for humidification purposes, which is relatively simple and inexpensive to construct, and which, in operation, is entirely reliable.

It is another object of the invention to provide a humidifying unit which may quickly and easily be assembled and disassembled for purposes of cleaning, inspection, repair or replacement.

A feature of the invention resides in the provision of a plurality of parallel spaced screens of suitable material such as wire or the like, and means for wetting the surfaces of said screens, the screens being arranged so that the air to be treated by the wetted surfaces thereof passes in a plurality of streams through the spaces between adjacent screens.

Another feature of the invention resides in the provision of a humidifying device including a plurality of screens of wire or the like, arranged in substantial parallelism in spaced relation with each other to provide a plurality of passageways therebetween for the flow of air or other gas which is to be humidified, the screens being maintained in desired spaced relationship by crimping portions of the screens, the crimped portions serving as spacer elements.

By virtue of this arrangement, assembly of a humidifier unit in accordance with the invention may be accomplished simply and quickly, for it is necessary only to insert the screens one behind the other in a suitable casing or frame work; the crimped portions of the screens serve automatically to provide and maintain the desired spaced relationship between adjacent screens.

Other objects, features and advantages of the invention will be more apparent from the following description to be read in connection with the accompanying drawing, in which:

Fig. 1 is a side elevational view, partly in section, of an air conditioning apparatus embodying the invention;

Fig. 2 is a front elevational view, partly in section, of the apparatus of Fig. 1;

Fig. 3 is a view in perspective of one of the gas and liquid contact units adapted to be employed in the apparatus of Figs. 1 and 2;

Fig. 4 is a fragmentary sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary sectional view taken on the line 5—5 of Fig. 3;

Fig. 6 is a view in perspective of one of the crimped screens employed in the unit of Fig. 3; and

Fig. 7 diagrammatically illustrates the application of the invention in a modified manner.

Referring now to the drawing, the numeral 10 designates generally a casing having an air inlet opening 11 formed in the lower portion of one of the walls thereof, and a plurality of air outlet openings 12 formed in the upper portion of the casing. The casing contains one or more fans 13 driven in any suitable manner. As shown, three fans are provided, driven by motor 14, connected by belt 15 to the shaft 16 upon which the rotary portions of the fans are mounted. Preferably, the inlet opening 11 of the casing is provided with a suitable grille 17 of any desired type. Fans 13 draw air through the inlet opening 11 upwardly through the interior of the cabinet 10, and then discharge such air through the outlet openings 12.

Within the cabinet 10 above the inlet opening 11, are provided one or more contact units generally designated 18. These are preferably removably mounted within the cabinet 10 as upon flange supports 19. The bottom portion of cabinet 10 comprises a sump 20 to which water is supplied through supply line 21 under the control of a suitable float-controlled valve or the like 22. Water is withdrawn from the sump 20, through the strainer 23, by pump 24 and is supplied through line 25 to spray header 26. The sprayed water passes through the contact devices 18, and the unevaporated portion thereof returns to the sump 20 for recirculation.

Above the spray header 26 is provided an eliminator 27 adapted to prevent the passage of entrained water particles to the outlet end of the cabinet 10. If desired, a heater 28 for heating the water supplied to spray header 26 may be provided. Fittings 29 provide for the suitable supply and return of any desired heating medium, such as steam. It is to be understood that an electrical heating device, or any other suitable heating means may be employed.

If desired, heating coils 30 may be provided within the cabinet 10 for heating the air or other gas passed therethrough. Steam or other suitable heating medium is supplied to the coils 30 through connection 31, and is relieved from the coil 30 through connection 32.

Fig. 3 illustrates, in perspective, one of the contact units employed in the apparatus above described. Each unit comprises a pair of side members 33 having flanges 34 and 35 at the upper and lower portions thereof respectively. Within the side walls 33, and supported between the flanges 34 and 35, are a plurality of screens 36 extending across the unit 18 and arranged so as to provide a plurality of substantially parallel passages 37 therebetween. The air circulated through the apparatus by the fans 13 is drawn upwardly through the passages 37 formed between the screens 36. Preferably the screens 36 are arranged substantially in parallelism, and preferably the passages 37 are all of uniform width.

The ends of each unit 18 are closed by end members 38 having flange portions 39. Bolts 40 extending through the side walls 33 and the flange portions 39 of the end members 38, serve to hold the end members 38, and hence the screens 36, in place in the unit. One end member 38 is provided at each end of the unit.

To insure the maintenance of the desired spacing between adjacent screens, each of the screens is crimped or bent at a plurality of points. The crimped portions thus formed, indicated at 41, serve to space the screens automatically and with the utmost simplicity. Thus, in assembling the unit 18, one of the end members 38 is bolted to the side walls 33 and the crimped screens are then inserted between the opposite side walls 33 and flanges 34 and 35. The screens thus supplied within the outer casing will be automatically spaced from each other by the crimped portions 41 thereof, and when a sufficient number of screens have been supplied the other end member 38 is bolted to the side walls 33. The unit is then completely assembled in a firm, secure and permanent manner, and may be stored, shipped or used as desired. If for any reason it is desired to disassemble the unit, this may also be done very readily so as to facilitate inspection, repair or replacement of any of the parts of the unit.

It will be appreciated that as assembled the crimped portions 41 of adjacent screens must not be in line with each other, since this would cause nesting of the screens and prevent the maintenance of the desired spaced relationship therebetween. Accordingly, the crimped portions 41 of adjacent screens 36 assembled in the unit are staggered, as shown in Figs. 3 and 5.

To facilitate manufacture, the screens may all be crimped uniformly in the manner illustrated in Fig. 6. Thus, the distance between the left hand crimped portion 41 and the left hand end of the screen 36 is less than the distance between the right hand crimped portion 41 and the right hand end of the screen 36. The screens as thus uniformly crimped during manufacture, may be nested and stored conveniently and compactly. However, when the screens are arranged for insertion in a unit 18, alternate screens are rotated through an angle of 180° so as to produce the staggered arrangement of the crimped portions which is shown in Figs. 3 and 5.

While any suitable material may be used for forming the screens, these are preferably formed of relatively fine wire having a diameter, for example, of the order of .047 inch and galvanized after weaving. The screens are spaced within the unit 18 so that there are preferably approximately five to the inch.

The vast surface of the screen assembly past which the air flows, provides for efficient vaporization of the liquid with which the surface is wetted. At the same time, the resistance to air flow through the parallel air passages is relatively low due to the fact that the air passages 37 are of substantial thickness and extend uninterruptedly in the direction of the initial air flow.

Further, since the spaces between the adjacent screens are relatively large, the unit does not clog up, either because of deposits in the water or air-borne impurities, the size of the air passages 37 being sufficient to permit larger particles, as well as the small particles, to be washed down from the surfaces of the screens and to be deposited in the sump 20.

While the invention has been described in conjunction with a counter-current flow of air and liquid, and while the screens have been shown as arranged in vertical position, it is to be understood that the invention is not thus limited. Fig. 7, for example, illustrates an alternative form of the invention in which the unit 18 is arranged in such manner that the screens 36 are horizontally disposed. A fan 42 forcibly circulates air through the unit 18 and a spray header 43 supplies spray to the unit 18, in the same direction as the air flow. As in the apparatus illustrated in Fig. 1, the eliminator 27 removes entrained water particles from air which has passed through the unit 18.

Because of the foraminous nature of the screen sheets, gas or air, in addition to flowing through the main passages, may flow through the sheets from one passage to another. This cross flow causes turbulence which materially assists both the humidification and cleaning action of the apparatus.

Since many changes may be made in the invention without departing from the scope thereof, it is intended that the foregoing description and the accompanying drawing be regarded as illustrative only and not in a limiting sense.

I claim:

1. In a humidifier device of the character described, a casing, means for routing air through the casing, a removable liquid and gas contact unit within the casing, said unit comprising a plurality of closely packed metallic screens having portions thereof crimped for the maintenance of desired spacing between adjacent screens, said screens providing a plurality of closely spaced parallel passages, the screens affording communication between passages, a spray device above the unit, and means for forcibly spraying liquid upon the screens whereby horizontal as well as vertical filaments comprising the screens receive liquid discharged from the spray.

2. In a humidifier device of the character described, a casing, means for admitting air into

the casing adjacent one end thereof and for discharging it at the other end thereof, a fan within the casing, a gas and liquid contact unit removably mounted within the casing, said unit comprising a pair of oppositely positioned members and an intermediate end member removably attached to the opposite members, a plurality of metallic screens removably and slideably positioned within and substantially filling the unit, said screens providing a plurality of parallel passages extending in the direction in which air flows through the device, a spray positioned above the unit for forceably delivering liquid upon the screens, the liquid flowing in a downwardly direction through the unit, the air passing through the unit in an upwardly direction in contact with the screens.

3. In a humidifier device of the character described, a casing, a fan within the casing for routing air therethrough, screen holding members comprises a separable unit positioned within the casing, a plurality of metallic screen sheets slideably and removably positioned between the holding members, spacing means integral with and forming part of the screen material for providing a plurality of parallel air passages when the screen sheets are packed one behind the other, a spray device positioned above the unit for forceably delivering liquid upon the packed screens, the air flowing through said passages in contact with the wetted screens.

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