United States Patent

Clark et al.

[15] **3,679,271**

[45] **July 25, 1972**

[54] SUPPORT FOR A FLUIDIZED BED

[72] Inventors: **Raymond C. Clark; Donn G. Ziebell,** both of Orange, Conn.

[73] Assignee: **Brunswick Corporation,** Chicago, Ill.

[22] Filed: **Nov. 19, 1969**

[21] Appl. No.: **878,103**

[52] **U.S. Cl.**.....**302/45,** 29/182.3, 222/195

[51] **Int. Cl.**.....**B65g 53/34**

[58] **Field of Search**.....210/496, 510; 29/182.3; 75/DIG. 1, 200; 209/486; 222/195; 302/45, 54

[56] **References Cited**

UNITED STATES PATENTS

3,379,345	4/1968	Gehrung	222/195
1,461,647	7/1923	Bookwalter	209/486
923,917	6/1909	Williams	209/486
3,092,581	6/1963	Jaffee	210/510
2,968,405	1/1961	Ueres	210/496
3,437,457	4/1969	Fisher	75/208
2,267,918	12/1941	Hildabolt	29/182.3
3,026,609	3/1962	Bryan	210/496
3,023,906	3/1962	Moore	210/496
2,946,450	7/1960	Shaw	210/496
3,069,017	12/1962	Colby	210/496
2,837,032	6/1958	Horsting, Sr.	210/510

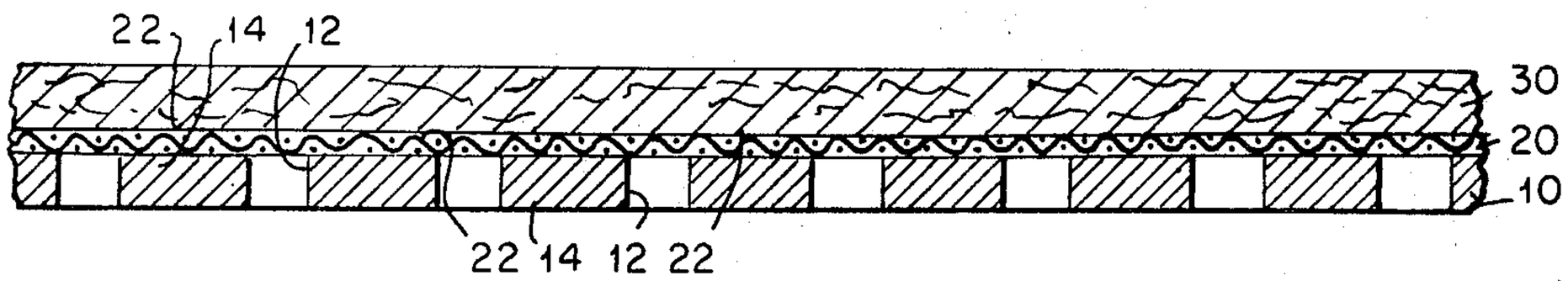
Primary Examiner—Carl D. Quarforth
Assistant Examiner—B. H. Hunt
Attorney—Donald S. Olexa, Sheldon L. Epstein, John G. Heimovics and William G. Lawler

[57] **ABSTRACT**

This invention relates to a support for a fluidized bed. The support consists of a perforated metal base, a wire screen adjacent the base and a mat of bonded metal fiber adjacent the screen.

1 Claim, 2 Drawing Figures

FIG. 1



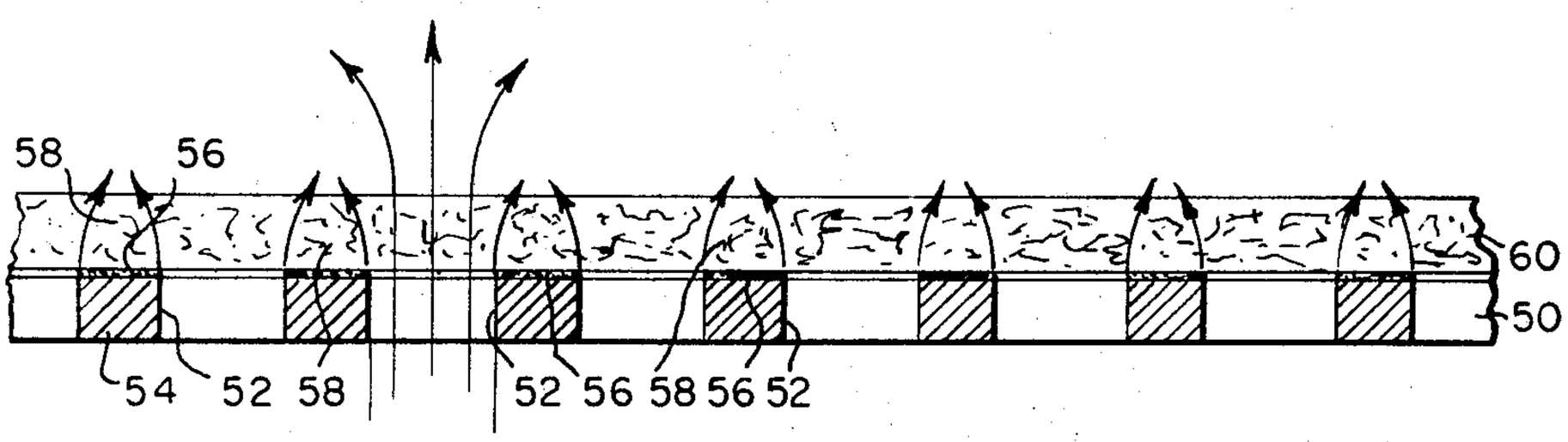


FIG. 2

RAYMOND C. CLARK
DONN G. ZIEBELL
INVENTORS

BY William S. Sims

ATTORNEY

SUPPORT FOR A FLUIDIZED BED

BACKGROUND OF THE INVENTION

Frequently it is desired to have structures through which fluid may be allowed to pass by diffusion through very small passageways. Thus, for example, in the transportation of finely divided particulate materials, such as cement, the vehicles in which such materials are transported frequently include structural members through which air may be blown for the purpose of fluidizing the particulate material and thereby facilitating its removal from the vehicle in question. Materials useful in such applications are shown, for example, in U.S. Pat. No. 3,237,812. Typically, such structures have included a constituent member for diffusing air by channeling it through a multiplicity of relatively fine, tortuous, air passageways. However, such diffusion members typically are comparatively weak structurally and this deficiency tends to become more aggravated as the permeability of the diffusion member increases. Therefore, since the diffusion members must be strong enough to support the weight of the load being carried and, frequently, the weight of men who enter the vehicles for purposes of cleaning them, removing their contents, etc., it is a common practice to reinforce such diffusion members, for example, by use of perforated metal backing plates of sufficient thickness and "land" area to insure adequate structural strength against breakage and other forms of damage during the aforesaid operations. However, the use of such structural reinforcements, involving, as it necessarily does, a substantial amount of "land" area through which fluid cannot pass, has heretofore resulted in "shadowing" effect on the diffusion member; that is, the land portions of the structural reinforcement tend to act as blocks to the passage of air through the diffusion member, resulting in a non-uniform distribution of diffused air or other fluid through the diffusion member. This lack of uniformity in diffusion is objectionable, for example, in aeration applications for several reasons, including lack of uniformity in the removal rate of the particulate material with which it is being used and the necessity for using higher air pressures in order to get the desired results.

Therefore, it is an object of the present invention to provide a structure through which fluid may be diffused substantially entirely uniformly throughout.

Another object of the present invention is to provide a fluid diffusing structure which is strong structurally but does not contain reinforcement "shadows."

Still another object of this invention is to provide a fluid diffusion structure having improved strength characteristics.

SUMMARY OF THE INVENTION

In accordance with the principles of the present invention, one embodiment thereof comprises a fluid diffusion member including a multiplicity of relatively small tortuous fluid passageways and a strength-reinforcing member in association therewith, with a plenum means interposed between the diffusion member and the reinforcing member such that fluid moving through passageways in the reinforcing member may diffuse laterally through the regions between the "land" areas of the reinforcing member and the facing side of the diffusing member, with the result that fluid may pass through the fine tortuous passageways of the diffusion member substantially uniformly throughout.

BRIEF DESCRIPTION OF THE DRAWING

Additional objects and advantages of the present invention, together with a better understanding thereof, may be had by referring to the following detailed description of the present invention, together with the accompanying drawing comprising;

FIG. 1 which is a cross-sectional view of one embodiment of this invention, and

FIG. 2 which is a cross-sectional view of a prior art structure.

DESCRIPTION OF THE PREFERRED INVENTION

Turning to FIG. 1, there is shown a cross-section of one embodiment of the present invention. It comprises a base member **10** made from structurally strong material such as stainless steel having perforations **12** therein with "land" (or unperforated) portions **14** between the perforations. Although in FIG. 1 this member is illustrated as being a perforated sheet of metal, it will be apparent that a wide variety of other structures may also be used to equivalent effect. Thus, for example, this member might be other than sheet-like in configuration and could, for example, be a "lattice" or other relatively strong structure having a multiplicity of apertures therethrough of sufficient dimension to ensure an adequate flow of fluid therethrough consistent with the structural strength requirements of the finished structure. Of course, a wide variety of some different materials may be utilized to make the base member suitable to the requirements of the particular use and environment with which the structure is to be involved, such as plastic materials, or even wood, or other well-known materials.

Shown in FIG. 1 as residing next adjacent to the structural strength member **10** is a plenum member **20**. In FIG. 1, the plenum **20** is shown as a woven wire structure of comparatively open weave; that is, with distances between the constituent arrays of wires several times greater than the diameters of the individual constituent wires. Of course, such spacings may be adjusted more open or more closed, depending upon the proportions desired and in accordance with well-known engineering principles. Although the plenum means **20** is illustrated in FIG. 1 as being made from woven wire, it will be obvious that a number of other materials might suitably be used to equivalent effect. Thus, a relatively open lattice, or an array of slat-like parallel members of non-woven configuration, as well as a wide variety of structures made from materials other than metals, such as plastics, natural materials, such as wood, and the like, might also be used. The important characteristic of the plenum member for purposes of the present invention is that it be of such a form and configuration as to permit the lateral diffusion of fluid passing through the apertures **12** in the base member **10** into the regions **22** residing between the "land" areas **14** of the base member **10** and the facing portion of the diffusion member **30**, thereby negating the "shadowing" effect that would otherwise occur. In effect, the interposition of the plenum produces a substantially uniform distribution of the fluidizing medium throughout the entire lower surface of the diffusion member which, in turn, ensures substantially uniform distillation through, and throughout the top surface of, the diffusion member.

This shadowing effect, which was a drawback of the prior art structures, is shown in FIG. 2 wherein is depicted a structural base member **50** comprising perforations **52** with "land" portions **54** interposed therebetween. Typically, such structures were adhered by means of epoxy or other adhesive compound **56** to one surface of a diffusion layer **60**. However, when air or other fluid was pumped through the apertures **52** in the base member **50**, the land portions **54** of the base member **50** had a blocking effect on the perviousness of the diffusion member **60**, thereby tending to "shadow" the presence of the land portions **54** of the base member **50** through to the surfaces of the diffusion member **60** in the form of "domes" **58** through which no significant amount of fluid was diffused.

Referring again to FIG. 1, it will be readily apparent that this objection with the prior art structures, as illustrated in FIG. No. 2, is overcome by the present invention. FIG. 1 in addition to the elements previously described, also includes a diffusion member **30**. This member comprises a multiplicity of very small tortuous paths through which air traveling through the apertures **12** in the base member **10**, and vertically and laterally through the plenum member **20** may be distributed substantially uniformly throughout the lower surface of the

diffusion member **30** and transmitted to the upper surface of the diffusion member **30** substantially uniformly throughout. This diffusion member may be produced from a wide variety of suitable materials, including bonded particulate materials; a term which is meant to include sinter-bonded ceramics, sinter-bonded metal powders, sinter-bonded metal fibers, braze-bonded metal powders or fibers, or any other form of integrated structure which includes a multiplicity of relatively small tortuous paths through which fluids may pass. Material particularly suited for this use are FELTMETAL fibermetal as manufactured by the Huyck Metals Company of **45** Woodmont Road, Milford, Connecticut, and those made in accordance with the teachings of Troy U.S. Pat. No. 3,127,668.

In the embodiment illustrated in FIG. **1**, the constituent elements thereof comprising the base member **10**, the plenum means **20**, and the diffusion means **30**, are in structural continuity with each other. By structural continuity is meant that the plenum means **20** which is interposed between the base member **10** and the diffusion means **30**, is in contact with both of them and that this contact may or may not be "fixed" which includes bonding, for example, by means of sintering, adhesives, and/or brazing.

The embodiment of the present invention which is illustrated in FIG. No. **1** may be made, for example, by taking a screen reinforced fiber metal structure made in accordance with the teachings of Fisher, U.S. Pat. No. 3,437,457 and bonding same to a perforated metal backing sheet, provided of course that the screen reinforcement is sufficiently above the plane of the fiber metal with which it is associated to permit the screen to function as a plenum means for the lateral distribution of air or other fluids. It has also been found that the integrity of bonds between a woven plenum means and the other constituent members of the structure to which it is affixed can be enhanced by flattening the "knuckles" of the woven structure to some extent, thereby providing a greater surface area for the adhesive, sinter, braze, or other bonds.

It will also be apparent from FIG. **1** that structures made in accordance with the present invention, particularly where the constituent members are affixed to each other, will be stronger than the structures of the prior art. This results from

the fact of the diffusion member **30** and the strength providing base structure **10** having been physically separated from each other by the interposition of the plenum means **20** which effectively increases the vertical cross-sectional thickness of the structure. According to well-known engineering principles, this has a tendency to transfer any forces acting vertically to the plane of the structure to the strength member **10** where they appear as stress moments of force, to greater advantage than, for example, in structure such as that shown in FIG. **2** where there is no significant amount of spacing between the diffusing member **60** and the base member **50**.

Thus it will be apparent that through the practice of the present invention an improved structure may be produced for the diffusion of fluids therethrough which will not exhibit the objectionable "shadow" effects of the prior art devices, and in addition will be significantly stronger structurally than the prior art devices.

While I have shown and described only particular embodiments of the present invention, it will be obvious to those skilled in the art that the illustrations given and the terms used herein are by way of illustration and not of limitation, and that additional changes and modifications may be made without departing from the present invention in its broadest aspects. Therefore, it is the intention of the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the present invention.

What we claim as new and novel and desire to secure by Letters Patent of the United States is:

1. A support for a fluidized bed for transporting particulate material comprising:

a. a base made from perforated metal plate;

b. a metal wire screen diffuser adjacent the base and metallurgically bonded thereto; and

c. a web of fiber metal adjacent the wire screen with the metal fibers of the web metallurgically bonded to each other and to the diffuser thereby providing a multiple path for fluid to pass therethrough wherein the diffuser distributes the flow of the fluid through the webs substantially uniformly.

* * * * *