March 29, 1949. A. D. HOLT 2,465,454

DECK CONSTRUCTION FOR DIRECT CONTACT CONDITIONING (COOLING OR DRYING) APPARATUS

Filed June 13, 1947 2 Sheets-Sheet 1

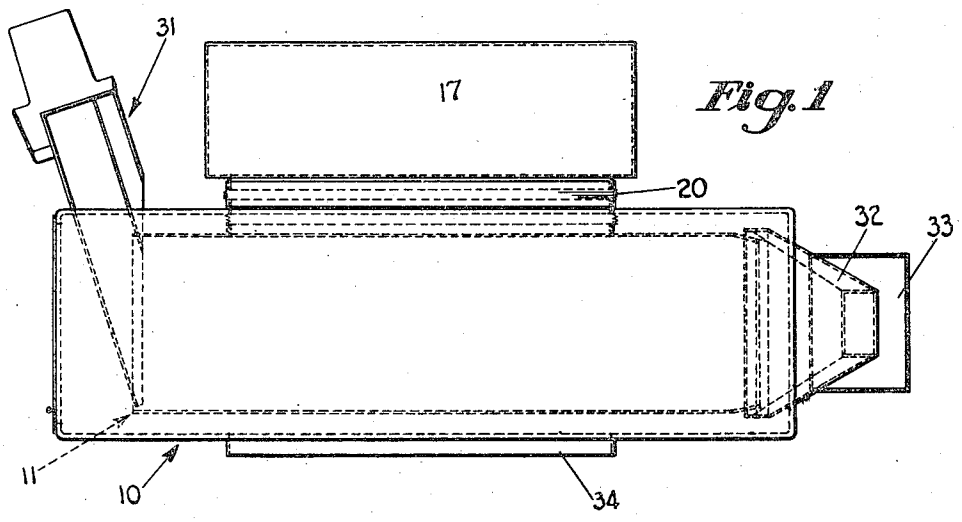


Fig. 1

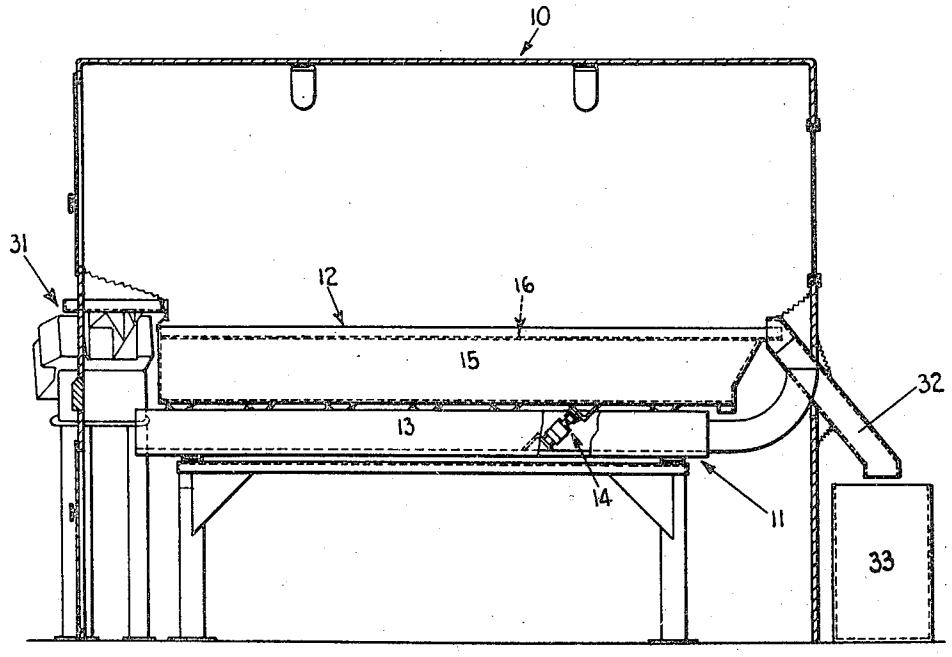


Fig. 2

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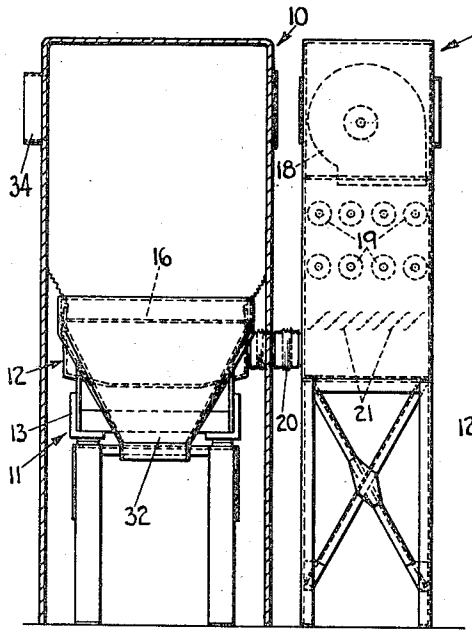


Fig. 3

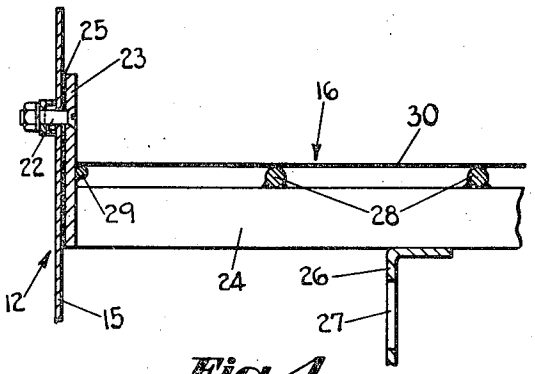


Fig. 4

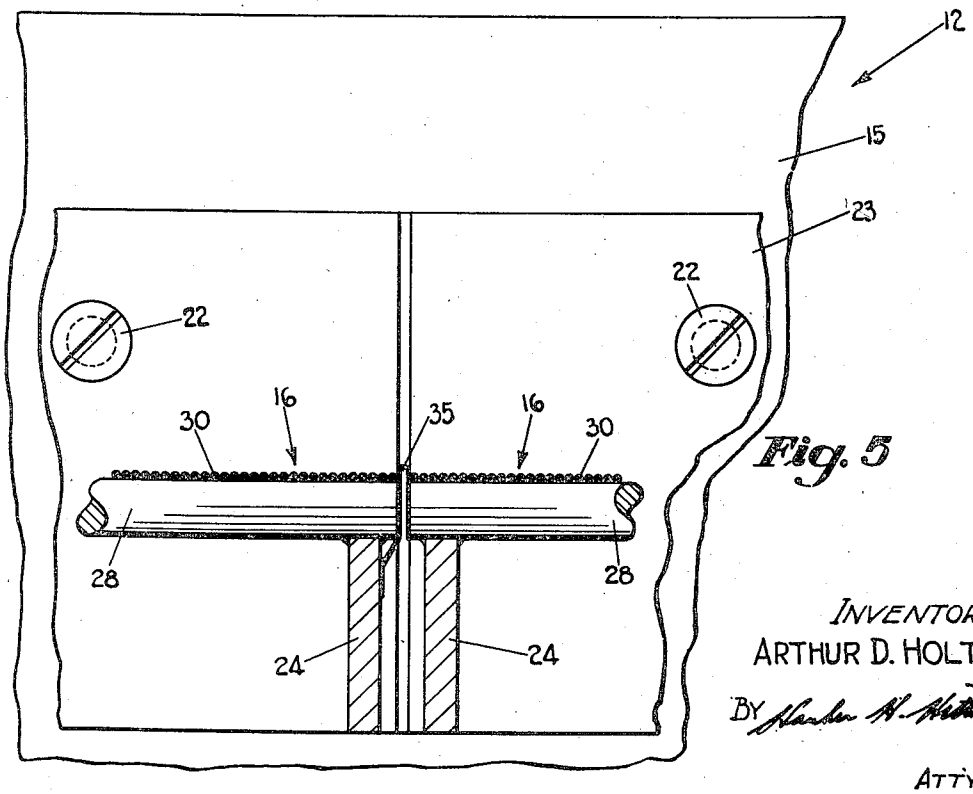


Fig. 5

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UNITED STATES PATENT OFFICE

2,465,454

DECK CONSTRUCTION FOR DIRECT CONTACT CONDITIONING (COOLING OR DRYING) APPARATUS

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Application June 13, 1947, Serial No. 754,576

2 Claims. (Cl. 34—237)

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This invention relates to an improved direct contact vibratory cooler or dryer apparatus and method, and an object of the invention is to provide an improved apparatus for and improved method of cooling or drying material, such as granular material.

Another object of the invention is to provide a method and/or apparatus of the above-mentioned type in which the material being treated or conditioned is fluidized by vibratory motion and conditioning fluid is passed upwardly therethrough in streams which are elongated in form and have an average width of three-thousandths to fifteen-thousandths inch, the streams being spaced apart from one-sixteenth to one-eighth of an inch.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is a plan view of an installation involving my invention;

Fig. 2 is a combination side elevational and sectional view of the apparatus of Fig. 1;

Fig. 3 is a combination sectional and end elevational view of said apparatus;

Fig. 4 is an enlarged sectional view through the deck of the vibratory conditioner; and

Fig. 5 is an enlarged sectional and elevational view of a detail of the apparatus.

The manner of conditioning, that is, either cooling or drying material, such as granular material, by direct contact with the conditioning fluid, such as hot air where it is to be dried and cold air where it is to be cooled, has been a problem existing for many years in the treatment of granular materials. The principal difficulties have been due to the fact that even distribution of the air streams over the bed of materials has been difficult to obtain. Where heretofore perforate plates, woven screen cloth, and the like, have been employed, difficulty has frequently been encountered because the fluid tends to channel or blow out in certain areas, thus robbing the remaining bed of fluid. In other words, there has not been a uniform distribution of the upwardly flowing conditioning fluid through the entire bed of materials which was to be conditioned. The apparatus herein disclosed has been found to be very successful to overcome prior difficulties and has produced an improved method of treatment.

As illustrated in the drawings, the apparatus includes a large conditioning chamber 10 which forms a housing or enclosure for a vibratory conditioner 11. The conditioner 11 is essentially a vibratory conveyer and includes a deck 12

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mounted for vibratory movement on a main or bed frame 13 by a plurality of springs, there being a plurality of spaced vibratory electromagnetic motors 14 interposed between cross angle members of the main frame 13 and the deck 12 which impart rectilinear vibratory motion to said deck 12, which makes an acute angle with the plane thereof so as to impart a positive vibratory motion to material on said deck to convey it from the left to the right, as viewed in Figs. 1 and 2 of the drawings. Vibratory conveyers of this general type are well known in the art.

The deck 12 is formed of a pair of laterally spaced parallel side members 15, as well as a bottom member and cross end members, so that it forms a completely enclosed plenum chamber except for the top which is in the form of a screen cloth 16, the structure of which is particularly significant in connection with my invention.

As illustrated in Figs. 1 and 3 of the drawings, adjacent the chamber 10 there is a heater and blower unit 17 which includes a blower 18 which is illustrated as of the centrifugal type and which draws air into the enclosing housing of the heater and blower unit 17 and forces it downwardly, as illustrated in Fig. 3, over heating coils 19, or the like, forcing it through a flexible conduit 20 into the plenum chamber which is formed by the enclosing portion of the deck 12 which is below the screen cloth 16. Adjustable guide vanes 21 are preferably provided to control the flow of fluid from the blower 18 to the plenum chamber 12.

The screen cloth 16 is preferably built up from a plurality of separable panels, each individually attached to the side walls 15 of the deck 12 by attaching bolt means 22, best seen in Fig. 4 of the drawings. Each of these panels includes a pair of spaced side plates 23 interconnected at opposite ends by a pair of vertical cross plates 24 which are welded or otherwise rigidly attached to the bottoms of the side plates 23. An air tight gasket 25, preferably of asbestos, is interposed between the side plates 23 and the side walls 15. The cross plates 24 are preferably held securely down on a longitudinally extending supporting rib 26 (see Fig. 4) which is formed as an integral part of the deck 12 and is preferably provided with a plurality of holes therein, one of which is seen at 27, so that the conditioning fluid, such as either warmed or cooled air, can flow freely through the plenum chamber 12, thereby equalizing the pressure over the entire area thereof.

Extending longitudinally of the deck 12 or transversely across the cross plates 24 is a plu-

rality of rods or ribs 28 which are welded to said cross plates 24. There is also a rod or rib 29 welded adjacent each side plate 23 and extending parallel with the rods 28 and preferably at substantially the same level. A flexible inverted U-shaped metal spring seal 35 is interposed between and abuts adjacent panels and is attached to one of them. Transversely of each panel and of the deck 12 there is a plurality of individual wires or rods 30 which may be round, triangular or other cross section, each welded to the rods 28 and 29. These wires 30 are of particular importance to the present invention. They have been constructed of one-sixteenth inch diameter with an average spacing of three-thousandths (.003) inch between them.

Tests indicate that for different materials the the size of the wires 30 and the spacing may be adjusted as the material to be treated changes in size. However, it is particularly important that the spacing be retained rather low, otherwise it is impossible to maintain an even distribution of air in the plenum chamber and an even flow of air through the entire area of the screen cloth 16. Tests also indicate that the spacing of the wire should be of the order of three-thousandths (.003) of an inch as a minimum and fifteen-thousandths (.015) of an inch as a maximum. The wire size is preferably one-sixteenth ($\frac{1}{16}$) of an inch, but may be as high as one-eighth ($\frac{1}{8}$) of an inch.

With this type of screen cloth the conditioning fluid will maintain a substantially uniform pressure in the entire plenum chamber. Furthermore, conditioning fluid flowing upwardly through the spaces between the wires will produce parallel spaced-apart elongated transverse areas of upwardly traveling fluid which moves at substantially the same velocity through the entire bed of materials which is supported upon the screen cloth 16 and moves longitudinally thereover from the feed end of the deck 12 to the discharge end, as hereinafter described more completely.

In view of the vibratory conveyer motion imparted to the material, such as granular material, the entire bed will be fluidized by the vibratory motion so that the uniformly distributed upwardly moving air will move readily through the bed of fluidized materials and have direct contact with substantially all sides of each individual particle. As a consequence, there will be a very efficient conditioning action on the material, whether it be a drying action where the air is heated or a cooling action where it is cooled. If the arrangement is such that it is desired to cool the material rather than dry it, cooling coils will be substituted for the heating coils 19. In other words, refrigerant will be circulated through the coils 19 rather than a heating liquid. The material to be conditioned (cooled or dried) may be fed to the material supporting surface provided by the screen cloth 16 by a vibratory feeder 31 which delivers it into the chamber 10 through flexible seals of known construction, delivering it to the feed end of the deck 12. The vibratory motion imparted to said deck 12 will fluidize the bed and convey the material to the right to its discharge position, delivering it to the discharge chute 32 which has a flexible seal with the chamber 10 and dumps into a receptacle 33.

The upwardly moving uniformly distributed conditioning air or fluid will travel upwardly through the screen cloth 16 and through the fluidized bed of granular material and flow out from the chamber 10 through an exhaust conduit 34. The spacing of the screen cloth 16 not only produces a uniform flow of upwardly flowing fluid, but also is such as to prevent material flowing downwardly therethrough. Any fine material which might tend to flow therethrough will be elevated by the upwardly flowing fluid.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. Conditioning apparatus including a deck having a screen cloth, said screen cloth being formed of a plurality of individual panels attached to said deck, and a flexible inverted U-shaped spring seal between adjacent panels.

2. Conditioning apparatus including a deck having a screen cloth, said screen cloth being formed of a plurality of individual panels attached to said deck, and a flexible inverted U-shaped spring seal between adjacent panels, one leg of said spring seal being attached to a panel, the other leg abutting an adjacent panel.

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