Feb. 17, 1970 J. T. GECEWICH ET AL 3,495,336

FLUID BED PROCESSOR

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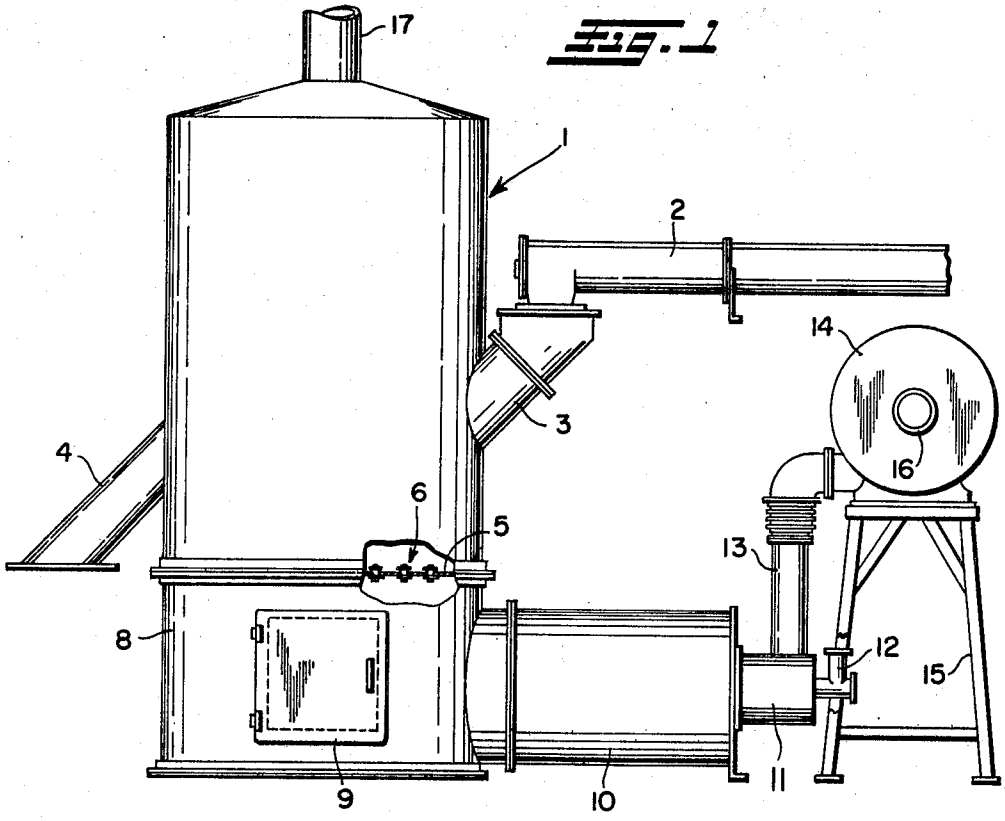
Fig. 1



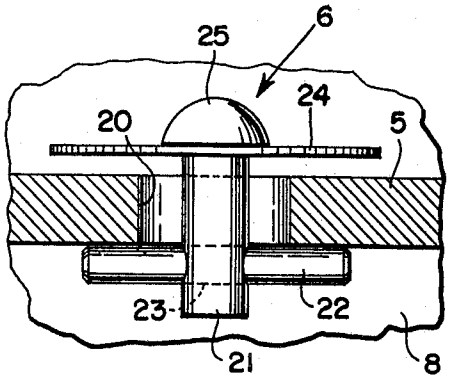




Fig. 2

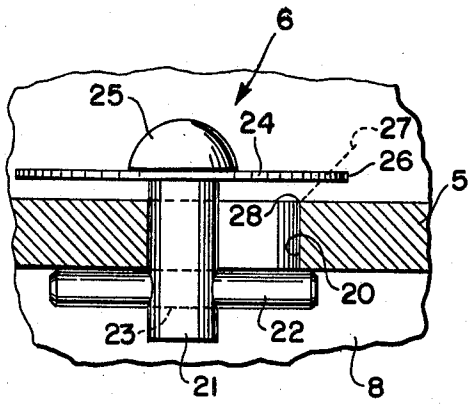



Fig. 3

INVENTORS

JOHN T. GECEWICH

DONALD E. METHENY

BY

Oberlin, Maky, Donnelly & Renner

ATTORNEYS

United States Patent Office

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# FLUID BED PROCESSOR

John T. Gecewich, Maple Heights, and Donald E. Metheny, Lakewood, Ohio, assignors, by mesne assignments, to Bartlett-Snow, a Division of Bangor Punta Operations, Inc., Bangor, Maine, a corporation of New York

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6 Claims

## ABSTRACT OF THE DISCLOSURE

A fluid bed processor having a grid separating the bed from a plenum therebeneath with a plurality of tuyeres in the grid for fluidizing the bed, each tuyere comprising a stud loosely fitted in an aperture in the grid and having limited axial movement in such aperture, a pin in the stud beneath the grid and a washer on the stud above the grid, the transverse dimension from the side of the stud to the opposite edge of the washer being such as to preclude flow of solids to the plenum in the open position of the tuyere regardless of the position of the stud in the aperture.

This invention relates generally as indicated to a fluid bed processor and more particularly to an improved tuyere or nozzle construction for fluidizing the bed. Heretofore, grids supporting the bed of fluid bed processors have been provided with caps or nozzles which are generally screwed into the grid plate and are provided with holes drilled or machined therein either radially or tangentially to obtain proper fluidization of the bed. The wall thickness of such nozzles generally require to be substantial so that when the processor is down, the solids of the bed will not flow back through the nozzle and into the plenum. Either the wall thickness must be sufficient so that the angle of repose of the solids of the bed will not permit backflow through the nozzle or special baffles or other types of construction are provided. Needless to say, such machined and drilled nozzles which are threaded into the grid plate are costly to construct and replace.

It is accordingly a principal object of the present invention to provide a tuyere for a fluid bed processor which will effectively fluidize the bed and yet be of a very economical construction.

Another principal object is the provision of a tuyere for a fluid bed processor which when the processor is down will positively close the grid to prevent flow of solids into the plenum.

Another object is the provision of a tuyere for a fluid bed processor in the form of a check plate type valve.

A further object is the provision of a tuyere for a fluid bed processor having simplified easily replaceable components.

Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail a certain illustrative embodiment of the invention, this being indicative, however, of but one of the various ways in which the principles of the invention may be employed.

In said annexed drawing:

FIG. 1 is a fragmentary side elevation of a fluid bed processor in accordance with the present invention;

FIG. 2 is an enlarged vertical section of the grid of the processor illustrating the tuyere of the present invention; and

FIG. 3 is a view similar to FIG. 2 illustrating the tuyere off-center within the aperture of the grid plate.



Referring now to the annexed drawing and more particularly to FIG. 1 which illustrates what might be termed a typical fluid bed processor, such processor comprises a vessel **1** into which the solids constituting the bed are fed by screw feeder **2** through inlet passage **3**. Outlet passage **4** is provided for such solids. The bed of solids is supported on a grid plate **5** having a plurality of tuyeres therein indicated generally at **6**. Such tuyeres may, for example, be spaced on centers of from about 3 to about 7 inches in the grid plate **5**. Beneath the grid plate **5** is a plenum chamber **8** provided with access door **9**. A combustion chamber **10** is connected to the plenum and a burner **11** having flanged gas inlet **12** is mounted on the end of the combustion chamber. Air inlet passage **13** connected to the burner is also connected to the outlet of a turbo-compressor **14** mounted on stand **15**. Air is drawn into the inlet **16** of the compressor **14** and passes through the burner **11**, the combustion chamber **10** and into the plenum **8** to pass upwardly through the tuyeres **6** to fluidize the bed of solids in the vessel **1**. The exhaust stack **17** is connected to a cyclone separator in conventional manner to remove fines. Other forms of fluid bed processors may, of course, utilize the present invention.

Referring now more particularly to FIG. 2, it will be seen that the grid plate **5** is provided with a plurality of apertures **20** in which are situated the check plate tuyeres **6**. Each tuyere comprises a stud **21** which may, for example, be a stainless steel buttonhead rivet. Below the grid plate **5** the stud is provided with a transverse roll pin **22** extending through transverse aperture **23** in such stud. Above the grid plate **5** the stud is provided with a stainless steel washer **24** beneath the head **25** of the stud.

In the illustrated embodiment, the apertures **20** in the grid plate **5** may, for example, be 1⅛ inches in diameter. The stud **21** may have a diameter of ½ inch or slightly less than half the diameter of the aperture. The pin **22** may be approximately 2 inches long, while the washer **24** may have an O.D. of approximately 2½ inches with a 9/16 inch I.D. The washer may be simply fitted loosely on the stud or may be tack welded thereto. The head **25** of the stud together with the washer **24** forms a cap over the aperture **20** which will be opened upon the application of pressure from the plenum **8**. The cap is of sufficient diameter, i.e. the diameter of the washer, to extend beyond the angle of repose of the solids of the bed regardless of the position of the stud within the aperture. Thus, as seen in FIG. 3, with the stud **21** against one side of the aperture **20**, the opposite edge **26** of the washer **24** will extend beyond the angle of repose indicated at **27** struck from the opposite top edge of the aperture indicated at **28**. Accordingly, regardless of the position of the washer and the stud on which it is positioned, the washer or cap of the tuyere will always overlie the aperture sufficiently to prevent backflow of solids into the plenum when the fluid bed processor is down. If for some reason a negative pressure is created in the plenum **8**, the check valve effect of the check plate tuyere **6** will, of course, immediately close the apertures **20** preventing the solids from being drawn through to the plenum.

The tuyeres, of course, can readily be replaced simply by knocking out the pin **22** from the aperture **23** of the stud. All of the parts of the tuyere, of course, may be purchased items and no machining or special manufacturing is required. Moreover, the substantial clearance between the aperture and the stud prevents cocking of the tuyere so that it is free to move within the aperture both for limited axial movement as dictated by the position

of the pin 22 and for lateral movement as seen in FIG. 3. With a ½ inch grid plate, the maximum clearance at the edge of the washer 24 between the top of the grip plate and the underside of the washer may be on the order of .1454 inch.

It can now be seen that there is provided a simplified economical and efficient tuyere for fluid bed processors which will preclude backflow of solids to the plenum.

Other modes of applying the principles of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such may be employed.

We, therefore, particularly point out and distinctly claim as our invention:

1. In a fluid bed processor, a grid supporting the bed with a plenum therebelow, a plurality of apertures in said grid, and check plate tuyeres axially movable in such apertures permitting gas flow from said plenum into said bed in response to pressure from said plenum but preventing the bed from dropping through said grid during shut-down.

2. A fluid bed processor as set forth in claim 1 wherein said check plate tuyeres each comprise a stud extending axially of an aperture, a cap on said stud overlying such aperture, and means limiting such axial movement of said stud within such aperture.

3. A fluid bed processor as set forth in claim 2 wherein the diameter of each said stud is substantially less than the diameter of the aperture.



4. A fluid bed processor as set forth in claim 3 wherein the diameter of the cap on said stud is sufficiently greater than the diameter of the aperture so that when the stud is adjacent one side of the aperture, the opposite edge of the cap will extend beyond the angle of repose of the solids of such bed struck from the opposite top edge of the aperture.

5. A fluid bed processor as set forth in claim 2 wherein said last mentioned means comprises a pin extending transversely of said stud beneath the aperture.

6. A fluid bed processor as set forth in claim 2 wherein said cap comprises a head on said stud, and a washer positioned on said stud beneath said head.

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J. SPENCER OVERHOLSER, Primary Examiner

J. S. BROWN, Assistant Examiner

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