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PNEUMATIC RAPPER FOR ELECTROSTATIC PRECIPITATORS

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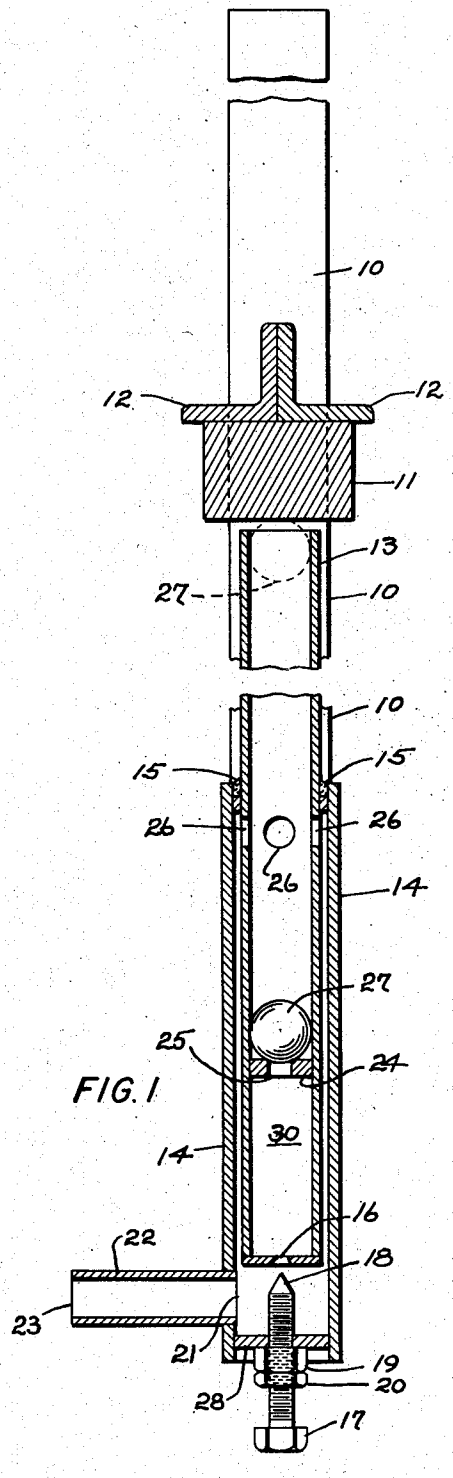


FIG. 1

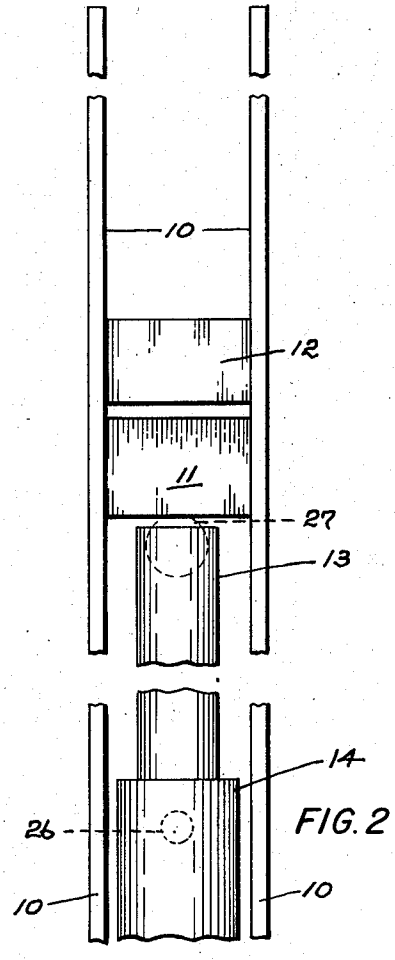


FIG. 2

INVENTOR
Albert G. Owen

BY Robert J. Palmer
Attorney

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PNEUMATIC RAPPER FOR ELECTROSTATIC PRECIPITATORS

Albert G. Owen, Sharon, Mass., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

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4 Claims. (Cl. 183—7)

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This invention relates to pneumatic rappers for the collector electrodes of electrostatic precipitators such as are used for the removal of fly ash from the flue gases of steam power plants.

Fly ash tends to agglomerate upon the collector electrodes of electrostatic precipitators used for cleaning the flue gases of steam power plants, and it is the practice to use rappers for periodically rapping the electrodes for dislodging the fly ash therefrom. Compressed air actuated rappers have not been entirely satisfactory in the past for the reason that it has not been feasible to locate the electric solenoid operated valves for controlling the admission of the compressed air to the rappers, sufficiently close to the rappers for providing the desired action, due to the high temperatures to which the rappers are exposed. With remotely located valves, the air pressure applied to the pistons of the prior pneumatic rappers built up so slowly that the desired quick impact action of the pistons against the electrodes was not possible.

This invention provides a compressed air operated rapper which is adapted to be controlled by a conventional remotely located solenoid actuated valve, and which is not only less complicated and expensive than the prior rappers, but provides quicker, more positive, rapper action.

An object of the invention is to increase the speed of operation of a compressed air actuated rapper for the collector electrodes of electrostatic precipitators.

The invention will now be described with reference to the drawing, of which:

Fig. 1 is a longitudinal section, of a compressed air operated rapper embodying this invention, with a sectional view of the anvil struck by the piston of the rapper, and a fractional side elevation of one of the two side plates of the collector electrodes between which the rapper is supported, and.

Fig. 2 is an elevation of the upper portion of the apparatus of Fig. 1 from a point at a right angle thereto.

The embodiment of the invention illustrated is adapted to rap the collector grid electrodes of electrostatic precipitators of the type disclosed, for example, in the G. W. Penney et al. Patent No. 2,382,253. The side plates 10 are attached to the collector grids, and have supported therebetween the anvil 11 which is attached, as by welding, to the channel members 12 carried by the side plates. Spaced slightly below the anvil 11 is the upper end of the vertically extending, inner tube 13 of the rapper, the lower end of the tube 13 being enclosed in the concentric outer tube 14 of larger diameter. The upper end of the tube 14 around the tube 13, is sealed at 15 as by being welded to the tube 13. The tube 14 can be supported from the casing of the precipitator.

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The lower end of the tube 13 is spaced above the lower end of the tube 14, and has the conical valve opening 16 in the center thereof. The bolt 17 having a conical upper end 18 extends through the center of the wall 28 in the lower end of the tube 14, and is threaded into the nut 19 contacting the wall 28, and is threaded into the lock-nut 20. The conical upper end 18 of the bolt 18 is in axial alignment with the conical opening 16 in the lower end of the tube 13, and is adapted, when the bolt 17 is screwed inwardly, to partially close the valve opening 16.

The inner end 21 of the tube 22 extends into a circular opening in the side of the tube 14 below the lower end of the tube 13, and its outer end 23 is adapted to be connected by tubing to a conventional solenoid actuated air valve which is not illustrated, and which admits slugs of compressed air at timed intervals into the tube 22.

The circular plate 24 having the small circular opening 25 therein, extends across the interior of the tube 13 above its lower end. The wall of the tube 13 has the four circular openings 26 therein below its upper end. The spherical, metal ball 27 having a slightly smaller diameter than the interior diameter of the tube 13 is located therein above the plate 24 upon which it normally rests when the rapper is inactive. The ball is adapted to act as a piston in the tube 13.

In operation, when a slug of compressed air is admitted through the tube 22 by the opening of its associated solenoid actuated valve, the compressed air is supplied through the valve opening 16 and the opening 25 in the plate 24 to the underside of the ball 27. This air builds up a pressure in the chamber 30 between the openings 16 and 25 which is sufficient to raise the ball 27 above the openings 26 which are the main openings for the air which propels the ball against the underside of the anvil 11. During this time there is substantially no air pressure except atmospheric, above the ball since the air entering the tube 13 above the ball escapes through the open upper end of the tube. When the ball is raised above the openings 26 the compressed air therethrough which reaches the openings 26 through the space between the tubes 13 and 14, propels the ball against the underside of the anvil 11 as illustrated by the dashed lines of Figs. 1 and 2.

When the associated solenoid actuated air valve is closed, the pressure below the ball will

escape through the small clearance opening between the ball and the interior of the tube 13, and the ball will fall by gravity, against the plate 24 as illustrated by the continuous lines of Fig. 1, in position to be propelled against the anvil when the solenoid actuated valve is next opened. The solenoid actuated valve would be periodically opened and closed at quick intervals as is conventional.

The time delay required for sufficient pressure to be built up in the chamber 30 to lift the ball above the openings 26 permits maximum pressure to be built up at the openings 26 following opening of the solenoid actuated valve, whereby full air pressure is available for propelling the ball at maximum speed against the anvil. In prior compressed air operated rappers, the air pressure against their pistons built up slowly following the opening of their remotely located, solenoid actuated valves, resulting in slower speeds of movements of the pistons and less effective impact against their associated anvils.

The bolt 17 can be adjusted for varying the effective valve area of the opening 16 thereby varying the time delay provided by the chamber 30. Thus different distances of the solenoid actuated valves from the rappers, or other variables, can be compensated for.

The ball 27 and the tube 13 should be of a metal such as steel, and the anvil 11 should preferably be of a metal such as medium hard steel whereby the ball will, in operation, form a seat for itself in the anvil thereby reducing the effective unit pressure, and reducing wear.

While one embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention is not limited to the exact apparatus and arrangement of apparatus illustrated, as modifications thereof may be suggested by those skilled in the art, without departure from the essence of the invention.

What is claimed is:

1. A rapper for a collector electrode of an electrostatic precipitator, comprising an anvil member adapted to be attached to the electrode, a tube having an open upper end spaced below the rapper member, a piston in the tube, said tube having an upper air inlet opening for admitting air thereinto for propelling said piston against said member, and having a lower air inlet opening for admitting air thereinto for propelling said piston above said upper inlet opening, and means for supplying compressed air to said openings.

2. A rapper as claimed in claim 1 in which means is provided for varying the pressure of the air supplied through the lower opening.

3. A rapper for a collector electrode of an electrostatic precipitator, comprising an anvil member adapted to be attached to the electrode, an inner tube having an open upper end spaced below said member, an outer tube having a larger diameter than that of said inner tube extending around the lower end thereof, the upper end of said outer tube around said inner tube being closed, said inner tube having an air inlet opening through its wall below said upper end of said outer tube, a perforated plate extending across said inner tube below said inlet opening, a piston in said inner tube above said plate, said inner tube having a lower air inlet opening below said plate, and means for supplying compressed air to said openings.

4. A rapper as claimed in claim 3 in which the lower air inlet opening is in the lower end of the inner tube, and means is provided for varying the effective area thereof.

ALBERT G. OWEN.

REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
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