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RAPPER FOR ELECTRICAL PRECIPITATION APPARATUS

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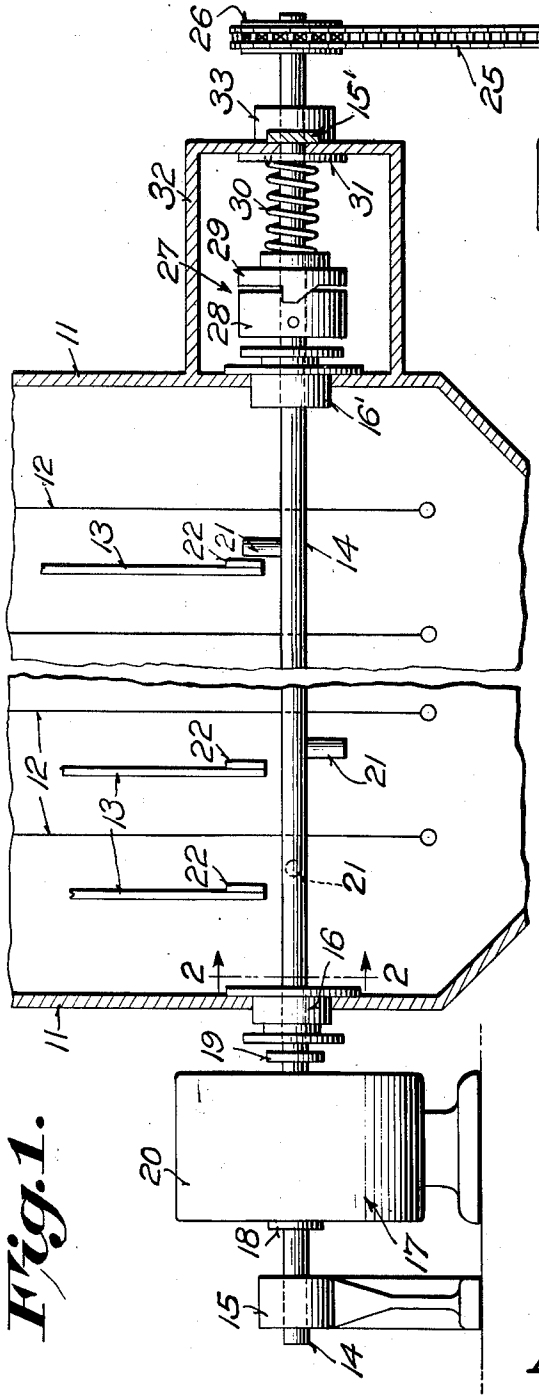


Fig. 1.

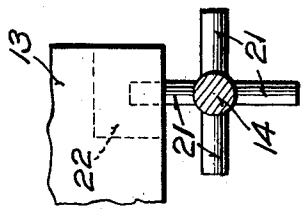


Fig. 2.

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RAPPER FOR ELECTRICAL PRECIPITATION APPARATUS

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This invention relates to a rapping device for use on an apparatus for electrical precipitation of suspended material from gases.

The principal object of the invention is to provide improved means for cleaning and removing precipitated or deposited material adhering to the electrodes of electrical precipitators.

A particular object of the invention is to provide means for cleaning the collecting electrodes of electrical precipitators by mechanically rapping or jarring single electrodes or groups of electrodes independently of the other electrodes, so that only a minimum amount of deposited material is liberated into the gas stream, thereby eliminating the necessity of providing dampers to prevent movement of the gas during the rapping period.

Another object is to provide such a device having a number of rapping or striking members equal to the number of plate electrodes, and to operate all of such elements by a single rapping mechanism, of much smaller size and power than is customarily required to rap or jar all of the electrodes simultaneously.

A further object of the invention is to provide a device utilizing the efficiency of individually rapping the collecting electrodes of an electrical precipitator, without the expense of providing individual rapping mechanism for each electrode which in large precipitators would be prohibitive.

These and other objects and advantages are provided by the electrode rapping device of the invention which in its preferred embodiment comprises a bar extending transversely of the electrodes, striker members staggered radially along the bar adjacent each electrode to be rapped, means for rotating the bar to bring successive striker members into striking position with respect to the corresponding adjacent electrode, and means for reciprocating the bar.

The invention will be more particularly described with reference to the illustrative embodiments of the invention shown in the accompanying drawings, in which:

Fig. 1 is a fragmentary view of an electrical precipitator showing the electrode rapping device of the invention; and

Fig. 2 is an enlarged fragmentary view showing the hammers and anvils of the rapping device.

Electrical precipitators of the Cottrell type generally comprise a casing with inlet and outlet for the gases to be treated, and two groups of opposed electrodes within the casing which are insulated from each other. In operation, the opposed electrodes are maintained at a high potential difference and the gases to be treated are passed through this strong electric field subjecting the gases to electronic bombardment and ionization. Free electrons and ions moving under the force of the electric field travel from the discharge electrodes to the collecting or plate electrodes. In order to maintain the efficiency of the precipitator the collecting electrodes must be periodically cleaned of the attached particles which increase resistance and cause excessive corona discharge and sparking.

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The electrode cleaning device of the invention, as shown in Fig. 1 of the drawing is attached to the side walls 11 of an electrical precipitator provided with discharge electrodes 12 and collecting electrodes 13.

In the preferred form of the invention a rapping bar 14, journaled in bearings 15 and 15' for reciprocating and rotary motion, passes through the side walls 11 of the precipitator perpendicular and adjacent to the lower edge of the collecting electrodes 13.

Stuffing glands or boxes 16 and 16' secured to the precipitator casing provide a gas-proof seal between the precipitator and the rapping bar. Additional rapping bar supporting bearings may be incorporated within the stuffing boxes on installations requiring additional bearing surfaces for the reciprocating rapping bar 14.

Located at one end of the rapping bar, externally of the precipitator casing 11, is the rapping mechanism 17 which may consist of any device adaptable to impart longitudinal displacement impulses to the rapping bar. In the form of the invention illustrated the rapping mechanism 17 is a double acting compressed air vibrator, for example, of the type shown in United States Patent 1.848,844 to C. E. Salmonson. Stops 18 and 19 attached to the rapping bar 14 may be provided on either side of the rapping mechanism housing 20 to limit the displacement of the rapping bar.

The principal striking members or hammers 21 are staggered radially along the periphery of bar 14, adjacent each electrode to be rapped. Each electrode may be provided with an anvil 22 secured to the electrode adjacent each of the jarring elements 21, whereby any hammer that is aligned with the corresponding adjacent anvil will jar the electrode when the rapping bar 14 is longitudinally displaced toward that electrode.

The number of electrodes simultaneously rapped when the rapping bar is reciprocated at any radial position is determined by the number

of hammers 21 that have been set to contact the electrodes at such position.

By rotating the rapping bar another hammer or group of hammers are brought into rapping alignment with the corresponding plate electrode anvils. Rotation of the rapping bar is accomplished in the illustrated form of the invention by an electric motor 23 through sprocket gear 24, drive chain 25 and sprocket gear 26.

Rapping bar drive motor 23 actuates an additional electrode jarring device 27 as it rotates rapping bar 14.

This rapping device 27 comprises a fixed ratchet 28 keyed to the rapping bar 14, a free floating ratchet 29, and a ratchet spring 30 attached at one end to ratchet 29 and at the other end to a spring anchor plate 31 which in turn is fastened to the end-wall of the ratchet assembly housing 32. Thus it will be seen that as bar 14 is rotated clockwise, fixed ratchet 28 is similarly rotated driving the free floating ratchet 29 out of engagement and compressing the spiral spring 30 until the ratchet 28 has rotated to a position which allows ratchet 29 to drop back into engagement, imparting a blow against anvil or anvils that are aligned with corresponding hammer pins 21.

In order to minimize wear upon hammer pins 21 and anvil plates 22 an electrical relay 33 of any well known type is incorporated in the rapping device to limit and synchronize the actuation of air vibrator 20 and drive motor 23 so that the air vibrator 20 is only in operation when the hammer pin or pins are in striking position with respect to the corresponding adjacent electrodes and the drive motor is stationary.

A typical cycle of operation comprises striking, for example, two of the electrode plates for ten seconds by reciprocating the rapping bar by the action of the air vibrator. Then the bar is rotated clockwise and as soon as ratchet 29 starts to move away from the fixed part of the ratchet element the air vibrator is stopped and remains stationary until the ratchet is dropped into engagement again, imparting a blow to a new set of electrode plates to be augmented by the air vibrator for ten seconds. Then the vibrator is stopped and the rotation repeated. This cycle may be continuous or timed to operate a fixed period each hour or day depending upon the individual requirement of the precipitator.

From the foregoing description it will be seen that the present invention provides an improved means for cleaning and removing precipitated or deposited material adhering to precipitator electrodes whereby the aims, objects and advantages of the invention are fully accomplished.

It will be evident that various modifications may be made in the construction of the device and in the form of the means for rotating and reciprocating the rapping bar. For example, the vibrator may be of the mechanical or magnetic type, or the vibrator may be used to impart both the rotative and reciproating motion to the rapping bar. It is further evident that through the use of insulated hammers, or rapping bars the device of the invention may be readily adapted for cleaning the discharge electrodes or both collecting and discharge electrodes.

I claim:

1. In an electrical precipitator, having electrodes in spaced relation to each other, an electrode rapping device comprising a rotatable bar extending transversely of the electrodes, striker members positioned in spiral spaced relation along the bar adjacent each electrode to be rapped, means for rotating said bar to bring successive striker members into striking position with respect to the corresponding adjacent electrode and means for reciprocating said bar.

2. In an electrical precipitator an electrode rapping device as defined in claim 1, wherein said bar extends through the walls of the precipitator.

3. In an electricial precipitator, an electrode rapping device as defined in claim 2, wherein the means for rotating and reciprocating said bar are positioned outside of the precipitator.

4. In an electrical precipitator having electrodes in spaced relation to each other, an electrode rapping device comprising a rotatable bar extending transversely of the spaced electrodes, striker members positioned on said bar adjacent each electrode to be rapped, certain of said striker members projecting in different radial directions along the axis of rotation of said bar from other of said striker members, means for rotating said bar to bring certain of said striker members into striking position with respect to the corresponding adjacent electrodes and thereafter to bring other of said striker members into striking position, and means for reciprocating said bar.

5. In an electrical precipitator having electrodes in spaced relation to each other, an electrode rapping device as defined in claim 4, wherein said rotatable bar extends through the walls of the precipitator.

6. In an electrical precipitator having electrodes in spaced relation to each other, an electrode rapping device as defined in claim 5, wherein the means for rotating and reciprocating said bar are positioned outside of the precipitator.

7. In an electrical precipitator having electrodes in spaced relation to each other an electrode rapping device as defined in claim 4 including anvil plates attached to each electrode at the point of impact of said striker members.

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