Dec. 10, 1963 W. STEUERNAGEL 3,113,852

CLEANING MEANS FOR CHANNEL-SHAPED DUST COLLECTING ELECTRODES

Filed May 5, 1961

4 Sheets-Sheet 1

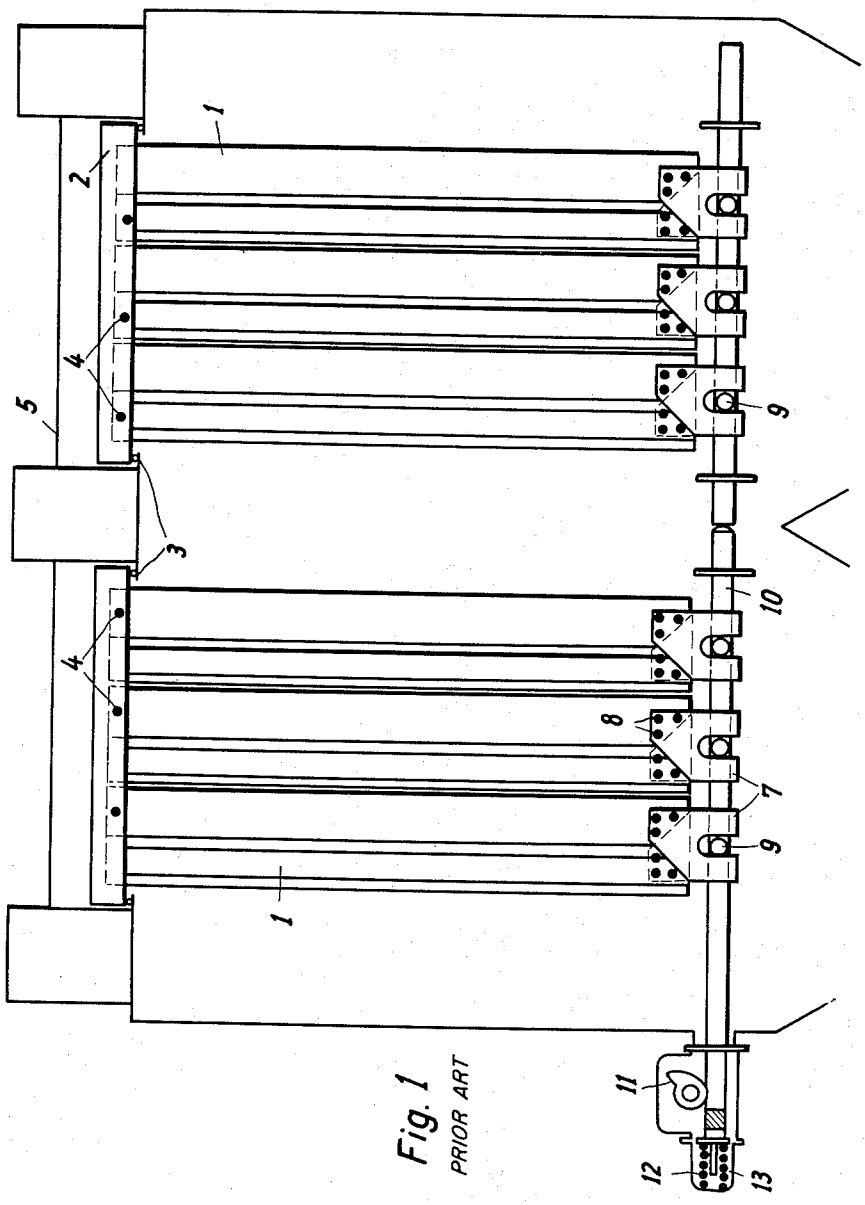


Fig. 1
PRIOR ART

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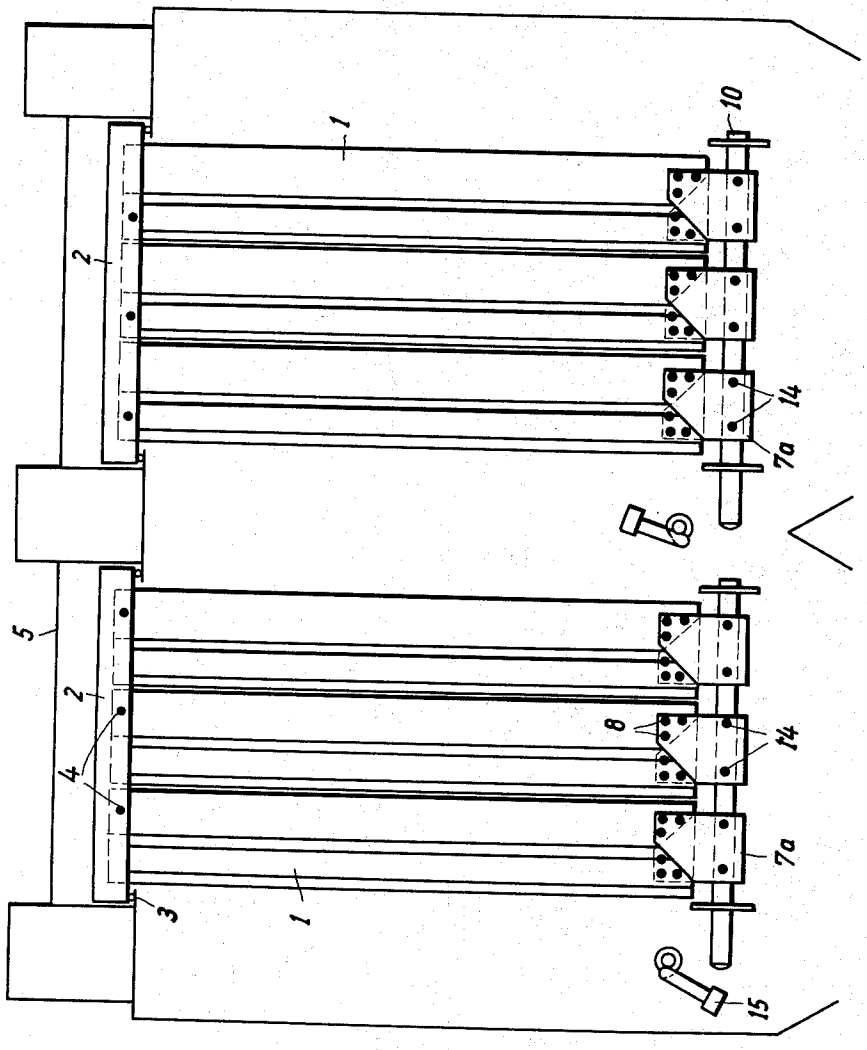


Fig. 2

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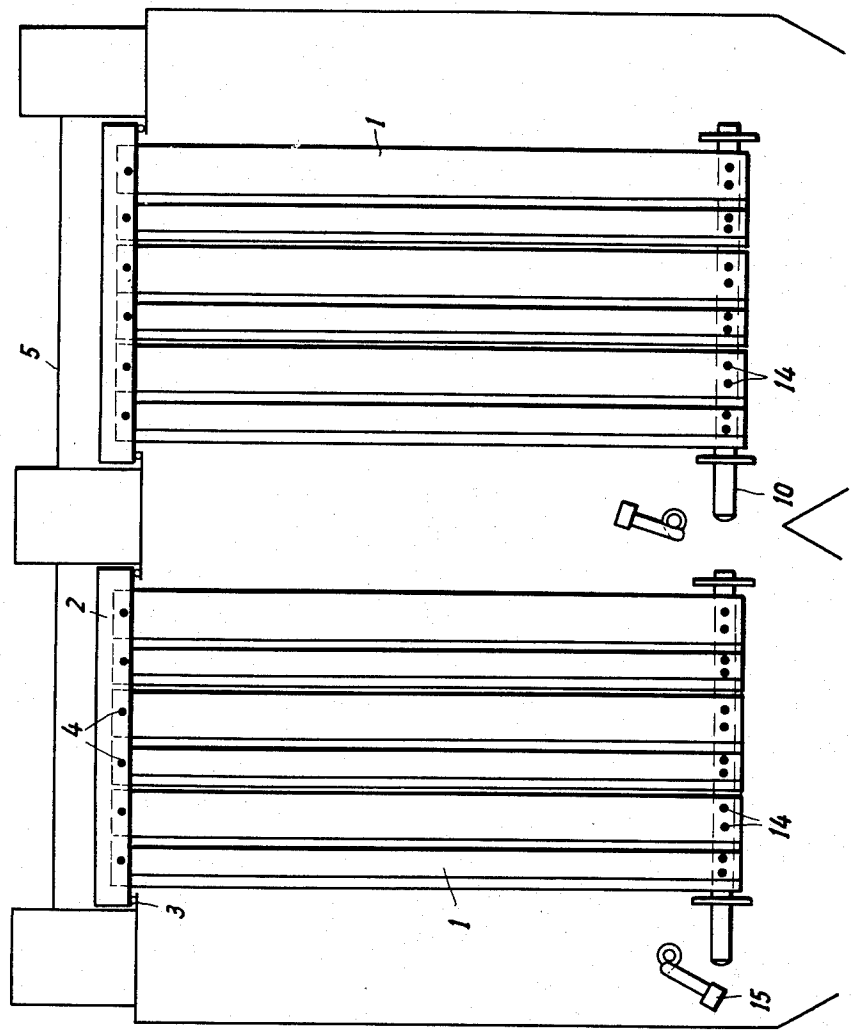


Fig. 3

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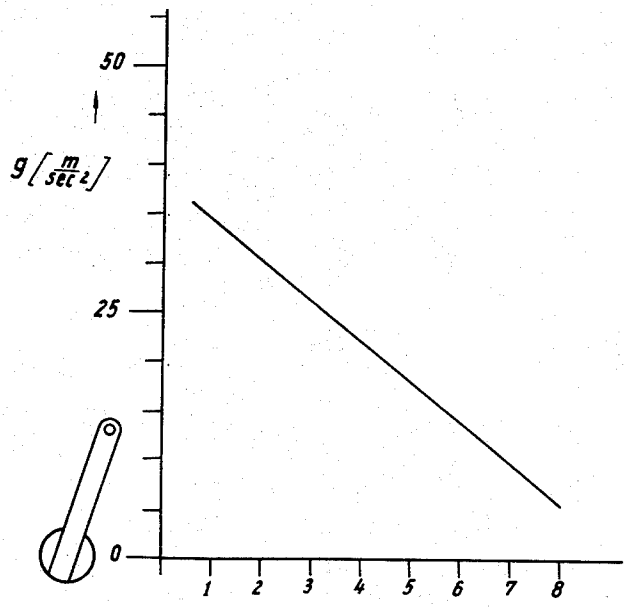


Fig. 5

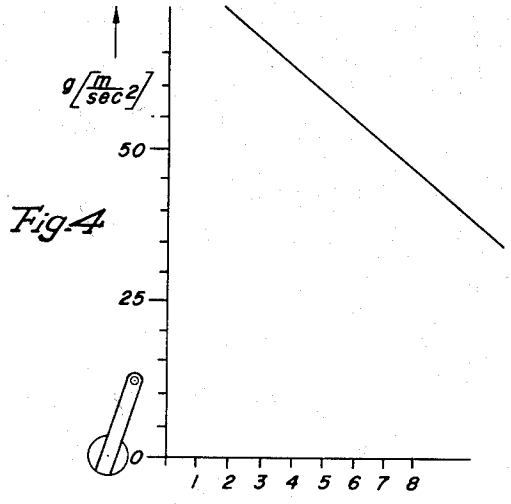


Fig. 4

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CLEANING MEANS FOR CHANNEL-SHAPED DUST COLLECTING ELECTRODES

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1 Claim. (Cl. 55—112)

This invention relates to dust collecting electrodes in an electrical precipitator and, in particular, to means for cleaning the dust collecting electrodes in the precipitator.

In the type of electric precipitator contemplated by this invention the dust collecting electrode is composed of rows of channel shaped members, the flanges of which are rebent toward the center of the channel. These channels are vertically positioned with the dust-laden gas passing horizontally between the rows of channels. The opening between the ends of the rebent flanges approximately corresponds to the distance between the spark discharge portions on the high voltage electrodes and the web of the channel. The channel members are welded together and face in alternate directions.

Dust collecting electrodes of this type have a good dust collecting capacity; and consequently, an equally effective means is needed for cleaning the electrodes from the dust collected thereon.

It is known that, in order to thoroughly clean the electrode channels of the plates down to the smallest quantity of residual dust, the plate shoud be struck or rapped perpendicularly to the longitudinal edges of the plate rather than at right angles to the web of the channels.

In rapping the longitudinal edges, the channel or plate is accelerated vertically as well as in the direction of the rapping blow. The so-called cross accelerations thus produced cause the dust to be shaken from the collecting electrodes. Consequently, the cleaning effect is greatly increased with the increased cross accelerations, and the amount of residual dust is correspondingly lessened.

Up to the present, for the purpose of producing the greatest possible cross accelerations and the greatest dust cleaning, the electrodes have been arranged so that two collecting electrode sections composed of several plates or channels are struck against one another on their longitudinal edges or are struck by a hammer. The individual plates forming the collecting electrodes are hung pendulum-wise from their upper ends and their lower ends are loosely secured by brackets to the hammer rapping bar. Generally the brackets have arched openings which fit over pins secured to the rapping bars so as to be loosely interlocked therewith. By so doing, the hammer blow on the rapping bar will be transferred to the electrode plates. Each plate section is suspended from a single point and joined to the rapping bar at one point so as to obtain the greatest possible transmission of energy when the plate section is jolted by the rapping bar. Because of the flexible connections, high cross accelerations on the plate sections are produced at right angles to the longitudinal edge of the electrode plates at one end of each plate; and for these reasons, large and heavy percussion means must be used in order to obtain an adequate cleaning of the electrodes.

In order to transmit the necessary impact energy to the electrode plates with the smallest possible energy loss, this invention cleans the dust from the electrode plates rapping a bar fastened to and common to a plurality of electrode plates. The electrode plates are centrally or preferably eccentrically hung from their upper ends and are rigidly secured to the rapping bar at the other end so that the vibrational energy is conducted transversely of the ends

of the electrode plates into the plates. By so doing, separate impact points are combined to a common source.

Experiments with this invention have shown that substantially greater cross accelerations are obtained when the impact energy is given solely by a trip hammer weighing about 7 kg. Because the rapping bars of this invention are rigidly secured to the ends of the electrode plates, the individual electrode plates begin to twist from their normal position upon being rapped since they cannot undergo any pendulum movement. An additional cross acceleration is thus produced which is superimposed upon the original cross acceleration coming from the rapping blow. Consequently, the cleaning effect is improved.

The heretofore experienced difficulties of sealing the area where the rapping bars pass through the wall of the precipitator housing when the rapping blows are produced by means of a cam wheel and spring are avoided in this invention since there is no difficulty of attaching the hammer to a shaft within the housing. Furthermore, the various electrode sections can be rapped by means of several trip hammers, each one being coordinated with a section and having a timing and impact energy depending upon the weight of the hammer. Such is not possible with former rapping systems since two sections were struck against each other at any given time. In this invention, the separate rapping of the individual sections does not materially complicate the construction. Moreover, a relatively high cleansing effect is achieved by this invention, and the amount of dust separation is increased due to the fact that the rapping is extended insofar as time is concerned.

The means by which the objects of the invention are obtained are described more fully with reference to the accompanying drawings, in which:

FIGURE 1 is a diagrammatic cross-sectional view of a precipitator showing the dust collecting electrode plates hung in a precipitator;

FIGURE 2 is a similar view of the dust collecting electrode plates of this invention;

FIGURE 3 is a modification of the invention shown in FIGURE 2; and

FIGURES 4 and 5 are graphs showing the cross accelerations for eight dust collecting electrode plates in units of g (acceleration due to gravity=9.81 m./sec.) in which the electrode plate is rigidly clamped in FIGURE 4 and in FIGURE 5 loosely connected according to the prior art structure of FIGURE 1.

As shown in the prior art structure of FIGURE 1, the dust collecting electrode plates **1** are hung from beams **2** resting on supports **3**. The electrode plates are hung from pins **4**. The plates are enclosed in the electrical precipitator housing **5**. At the lower ends of plates **1** are brackets **7** rigidly secured to plates **1** by rivets **8** or the like. In this prior art construction, the brackets **7** have arched slots which loosely interlock with pins **9** secured to the rapping bar **10**. This bar **10** is hit and rapped by the rotation of a cam wheel **11** which drives the bar against the pressure of spring **12**, with the spring bearing against the end of bar **10** and a yoke **13**.

In FIGURE 2, the plates **1** are hung from the beam **2** as in FIGURE 1. The lower ends of the plates **1** are, however, rigidly joined to rapping bars **10** by means of brackets **7***a* and bolts or rivets **14**. Each section of electrode plates is rapped by being hit by a hammer **15**.

In the modification of FIGURE 3, the rapping bars **10** are connected by bolts **14** directly to the lower ends of plates **1** without using the brackets **7***a* of FIGURE 3 in order to obtain similar cross accelerations. In all forms of this invention, when the rapping bars **10** are used alone or in connection with brackets **7***a*, they always have a minimum weight or, in other words, a certain ratio with respect to the mass of the electrode plates **1**. The rapping

times and hammer weights can be proportioned as needed in individual cases. Experiments have shown that the increase in cross accelerations is obtained in an electric precipitator having electrode plates 6 meters high and 4 meters wide, a weight of from 300 to 1800 kg., a rapping bar weight of from 15 to 150 kg., and a hammer having a weight from 3 to 30 kg.

The graph of FIGURE 4 shows the result produced by the use of hammer blows as in FIGURES 2 and 3. The ordinates represent the accelerations produced and the coordinates represent the accelerations received through eight electrode plates rapped by a single hammer. As shown, the eighth plate receives an acceleration of about 41.5 m./sec.^{2}. This is compared to the graph of FIGURE 5 which, for the prior art structure of FIGURE 1, shows that the eighth plate receives an acceleration of but slightly more than 5 m./sec.^{2}. In each case, the accelerations decrease from the first to the eighth plate whenever the rapping bar is struck adjacent the first plate.

Having now described the means by which the objects of the invention are obtained, I claim:

In an electrical precipitator having a row of dust collecting electrode plates lying in a common plane, supporting means for rigidly securing at a single point one end of said plates, and rapping bar means contacting the other ends of said plates for shaking dust therefrom, the improvement in which said rapping bar means comprises a bar extending parallel to the lower ends of said plates and common to and rigidly joined to said plates to prevent relative movement between said plate ends and said bar, and hammer means for striking said bar at one end thereof for conducting plate twisting vibration energy into the plane of each plate at the end joined to said bar.

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