

June 28, 1966

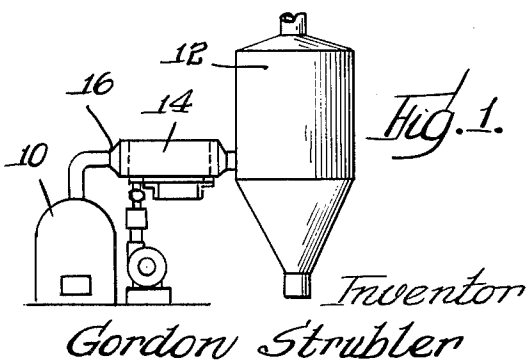
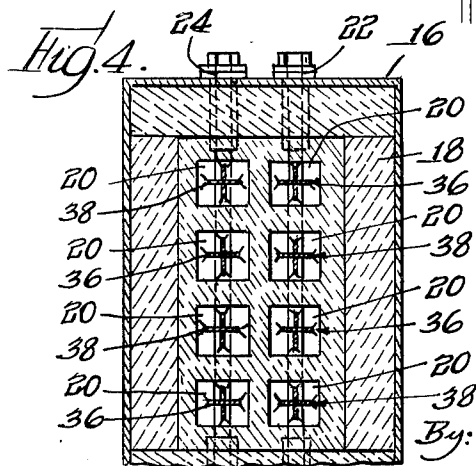
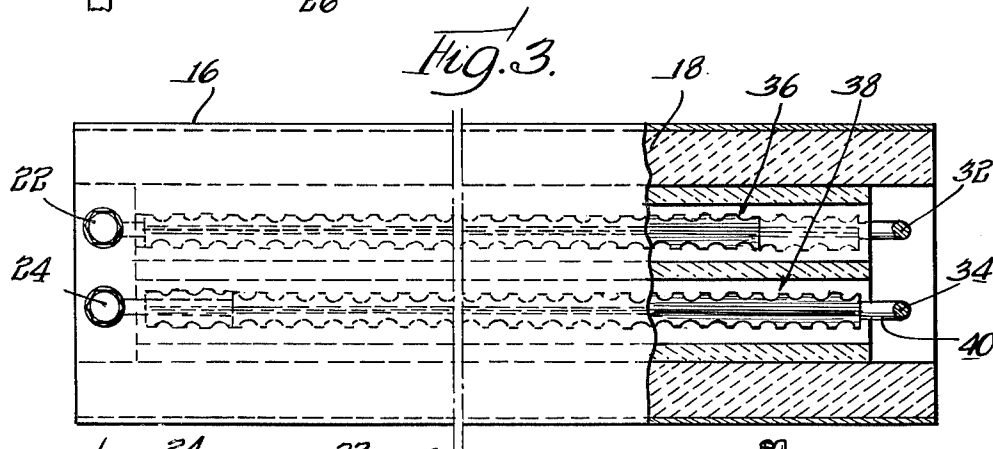
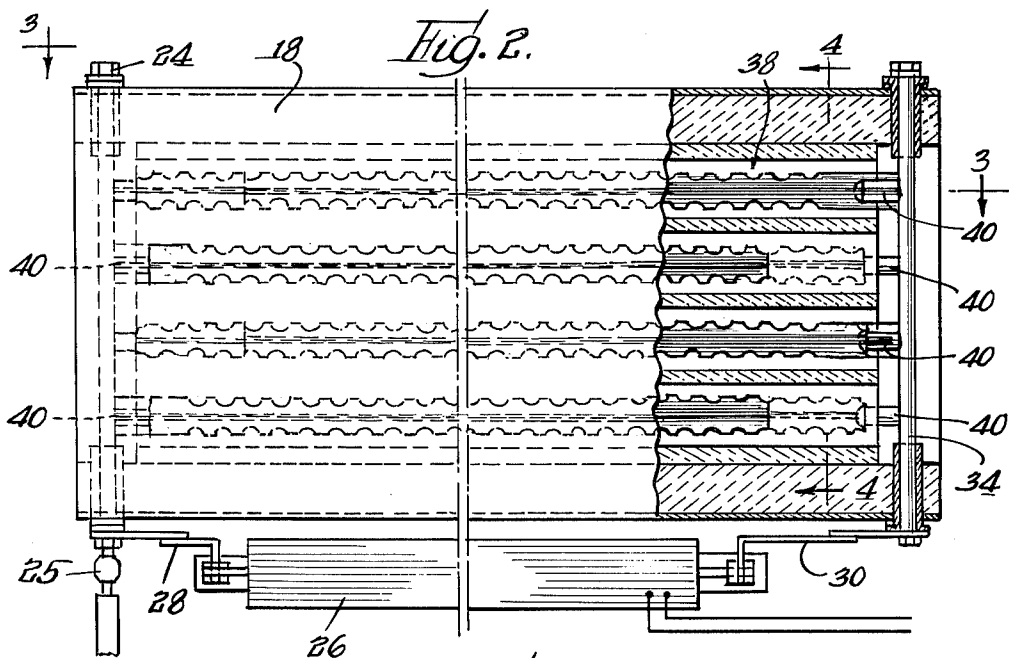
G. STRUBLER

3,257,779

ELECTROSTATIC AGGLOMERATOR HAVING AN IMPROVED
DISCHARGE ELECTRODE STRUCTURE

Filed Sept. 15, 1961

2 Sheets-Sheet 1



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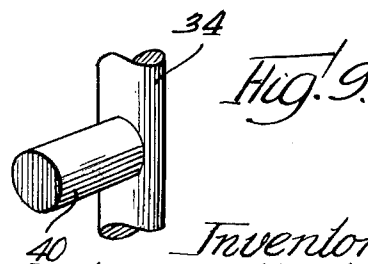
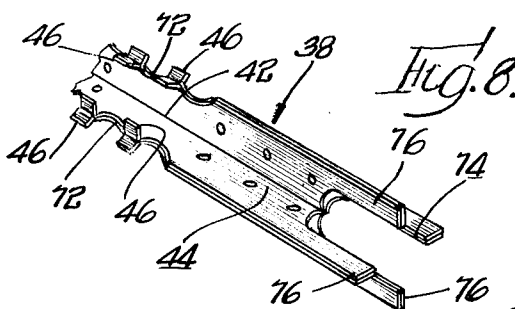
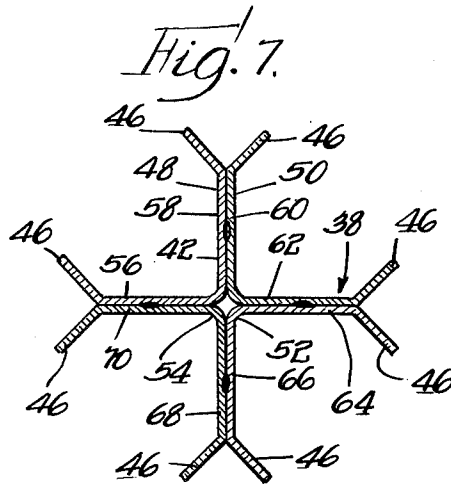
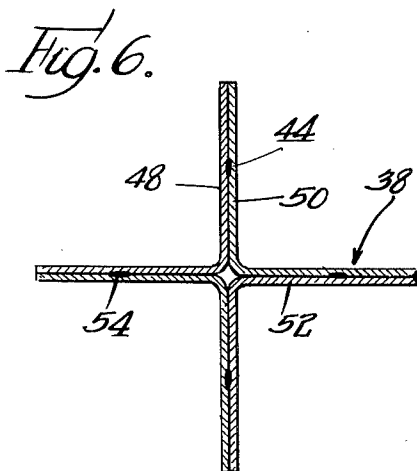
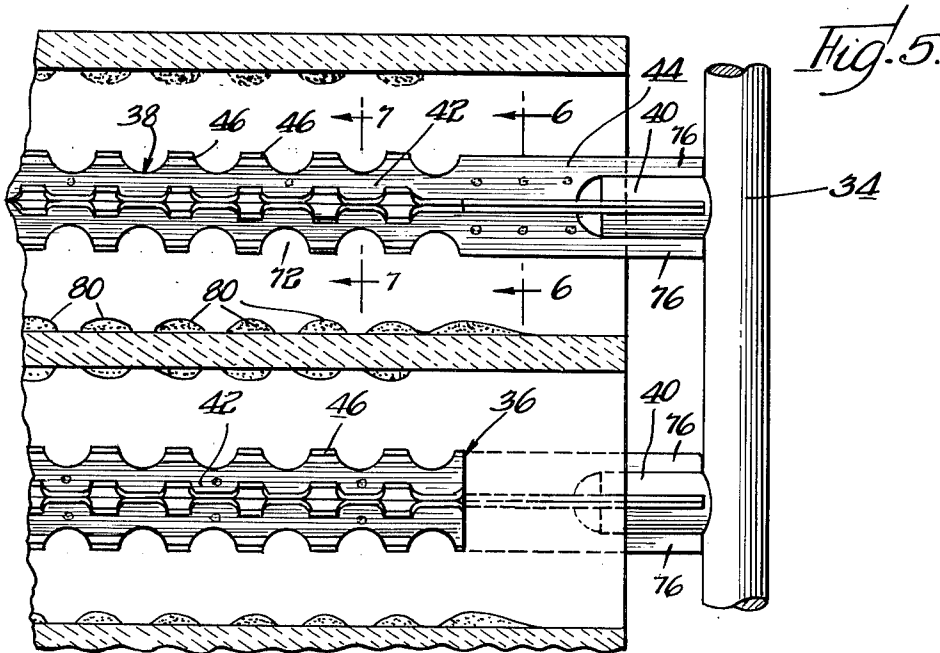
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2 Sheets-Sheet 2



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ELECTROSTATIC AGGLOMERATOR HAVING AN IMPROVED DISCHARGE ELECTRODE STRUCTURE

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4 Claims. (Cl. 55-123)

This invention relates to an electrode and more specifically to an improved electrode construction for use in an agglomerator shown and described in detail in applicant's copending application, Serial No. 22,218 filed April 14, 1960, now Patent No. 3,110,580, entitled "Device for Agglomerating Microscopic Particles."

The electrodes shown and described in the above-mentioned copending application operate in a satisfactory manner. However, it has been found that the electrode disclosed herein is superior to the electrode in the aforementioned application. The present electrode is more effective in agglomerating particles in that with the same spacing and voltage a greater quantity of particles are agglomerated when the instant electrode is used than when the prior art electrode is used. The construction of the present electrode is also improved in that it allows an easy exchange of one electrode for another when there is wear of one of the electrodes. Furthermore, the electrode has a construction which permits it to be of light weight without substantial loss of strength.

Other advantages and uses of the hereindisclosed invention will become readily apparent to those skilled in the art upon a perusal of the appended specification in light of the accompanying drawings in which:

FIGURE 1 is a side elevation showing an agglomerator embodying the present invention mounted in an operative position;

FIGURE 2 is a partial cross-sectional view of a fragmentary portion of the agglomerator shown in FIGURE 1;

FIGURE 3 is a partial cross-sectional view taken on line 3-3 of FIGURE 2;

FIGURE 4 is a cross-sectional view taken on line 4-4 of FIGURE 2;

FIGURE 5 is an enlarged cross-sectional view of a portion of the interior of the agglomerator showing the details of the construction of the electrode;

FIGURE 6 is a cross-sectional view taken on line 6-6 of FIGURE 5;

FIGURE 7 is a cross-sectional view taken on line 7-7 of FIGURE 5;

FIGURE 8 is a perspective view of a mounting portion of the electrode shown in FIGURES 6 and 7; and

FIGURE 9 is a perspective view of a portion of an electrode rod and stud for supporting an electrode.

Referring now to the drawings and especially to FIGURE 1, it may be seen that a smoke-producing furnace 10 is connected to a cyclone 12 through an agglomerator 14, which is disclosed in detail in the aforementioned copending patent application, and the agglomerator is connected to a casing 16 which conducts smoke from the furnace into the agglomerator and envelops the agglomerator.

The agglomerator 14 generally consists of a dielectric ceramic block 18 which has a plurality of parallel apertures 20 extending therethrough. A pair of conductor rods 22 and 24 are fixed in one end of the agglomerator and are connected to a transformer 26 through a bus bar assembly 28. The conductor rods 22 and 24 which also form a portion of the means for cleaning the apertures are connected to a source of air under pressure (which is not shown) through a valve 25. The other side of the transformer is connected by bus bar assembly 30 to a pair of conductor rods 32 and 34, which rods are con-

nected to block 18. The transformer is electrically connected to a source of alternating electrical energy, which is not shown, so that the transformer has a potential between 10,000 volts and 30,000 volts on its output side.

Electrodes 36 are connected to rods 22 and 24, and thus to one side of transformer 26. Electrodes 38 which are identical in construction to electrodes 36, are connected to rods 32 and 34, and thus to the other side of the transformer 26 so that there is an electrical potential between the electrodes 36 and 38. Four electrodes 36 are positioned, respectively, in the center of four of the apertures 20 and extend away from their respective rods to the right as viewed in FIGURE 2. In like manner, four electrodes 38 are positioned, respectively, in the center of the four remaining apertures and extend away from their respective rods, but electrodes 38 extend to the left as viewed in FIGURE 2. The electrodes 36 and 38 are coextensive for a major portion of the electrode length as may be clearly seen in the drawings.

In this instance, each of the conductor rods 22, 24, 32 and 34 has an electrode stud 40 fixed thereon perpendicular to the axes of the respective conductor rods. Each of the electrodes is secured to its respective electrode rod by means of stud 40.

Each of the electrodes 36 and 38, generally consists of a base 42 having an electrode mount 44 formed integral therewith, which mount frictionally engages its respective stud 40, and a plurality of corona protuberances 46 extending outwardly from the base, each of which protuberance is identical to the other.

Looking now to FIGURE 7, it may be seen that the specific construction of electrode 38, which is also the construction for all the electrodes, is such that the electrode consists of four identical right-angle strips or members 48, 50, 52 and 54. Right-angle strip 48 includes wall or arm 56 which is formed integral with and perpendicular to a wall or arm 58. The strip 50 includes a wall or arm 60 which is spot-welded to wall or arm 58 and has an integral and perpendicular wall or arm 62 which is parallel to wall or arm 56. The third strip 52 includes a wall of arm 64 which is spot-welded to wall or arm 62 and has an integral and perpendicular wall or arm 66 which is parallel to wall or arm 60. The fourth and last strip 54 includes a wall or arm 68 which is spot-welded to wall or arm 66 and integral and perpendicular wall or arm 77 which is spot-welded to wall 56 of the first-mentioned strip 48. Each of the above-mentioned eight walls has a plurality of protuberances 46 formed integral therewith. The protuberances are formed by the removal of notches 72 from the walls so that there is a one-eighth inch space between notches thus forming protuberances or tabs. The protuberances are bent at 45 degrees to their respective walls so that there is an angle of 90 degrees between adjacent protuberances as may be clearly seen in FIGURE 7. From the foregoing description and the FIGURES 6 and 7, it is evident that each of the electrodes has a cross-section which is in the general form of a cross.

As was mentioned above, each of the electrodes includes an electrode mount 44 which cooperates with its respective stud 40. The electrode mount is formed by cutting out elongated notches 74 such as that shown in FIGURE 8 so that the stud may be received between the arms. Inasmuch as each of the electrodes in this instance is made of a stainless steel and the cut-out portion of the notches 74 provide a space somewhat smaller than the respective stud 40, the resilience of arms 76, which are formed by the remaining material in the strips 48, 50, 52, and 54, urges the arms into engagement with the respective stud to fix the electrode to the stud and thus the conductor rod. It is readily apparent how the electrode may be readily removed and replaced when there is any wear

of the electrode by simply pulling the electrode off its respective stud and pushing a new electrode onto the same stud.

The operation of the hereindisclosed electrodes is quite similar to the operation of the electrodes described in the aforementioned copending application. The transformer 26 is energized by a source of alternating electrical current so that there is a voltage potential of between 20,000 and 22,000 volts between adjacent electrodes. The present electrodes have a plurality of corona protuberances. There is a tendency of electrical charges to gather at the protuberances and it has been observed that an increased amount of particles agglomerate on the walls of the ceramic dielectric block in a position adjacent to the protuberances as shown in FIGURE 5 where mounds of particles 89 are positioned adjacent to protuberances. Inasmuch as there are an increased number of protuberances, the effectiveness of the agglomerator is improved.

From the foregoing description, it is readily apparent how the present invention may be economically manufactured and may be simply mounted in an agglomerator, and the replacement of the electrode is simplified.

Although a specific embodiment of an electrode has been shown and described it will become readily apparent to those skilled in the art upon a perusal of the accompanying specification that there may be many additions, variations and modifications made without departing from the spirit and scope of the hereindisclosed invention. It is expressly understood that the present invention is limited only by the appended claims.

What is claimed is:

1. In an agglomerator including a dielectric block having at least a pair of apertures extending from one end of the block to the other, a source of high voltage alternating current, and a casing connected to one end of the dielectric block for conducting smoke to the apertures, the improvement comprising; an electrode positioned longitudinally in each of said apertures and being connected to the source of high voltage alternating current to provide an electrical potential between the electrodes, each of the electrodes including a plurality of elongated angle members, each of said angle members having at least first and second side arms, said first and second side arms defining an angle member angle therebetween, the vertex of each angle member angle being disposed substantially at a common point, said side arms of said angle members extending radially outwardly from said common point, all of said side arms being substantially longitudinally coextensive with each other, the first side arm of each angle member being substantially transversely coextensive with and secured in facial engagement to the second side arm of an adjacent angle member to form a plurality of base members extending radially outwardly from said common point, the outer radial extremity of each base member terminating generally on a circle having its origin at said common point, longitudinally spaced apart pairs of substantially longitudinally coextensive protuberances extending from the radial extremity of each base member to provide longitudinally extending rows of alternate recesses and pairs of protuberances on the electrode at the radial extremity of each of said base members, each pair of protuberances com-

prising first and second substantially divergent protuberance members, the first and second protuberance members of each pair of protuberances being integral with the first and second side arms respectively of the base member with which the pair of protuberances is associated, an obtuse angle being formed and included between first and second protuberance members of each pair of protuberances and the first and second side arms respectively of the base member with which the pair of protuberances is associated.

2. The combination defined in claim 1 in which the angle formed by the first and second protuberance members of each pair is substantially 90°.

3. The combination defined in claim 1 in which the longitudinal distance between pairs of coextensive protuberances is greater than the extent of the protuberances longitudinally.

4. The combination defined in claim 1, in which the angle members at one end of the electrode have portions removed at the junction of the arms to provide a plurality of resilient gripping portions, and an electrode support is provided which is resiliently gripped by said portions.

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