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 TERMINAL CONSTRUCTION FOR ELECTRICALLY HEATED
 SCREENS OF MATERIAL SEPARATORS
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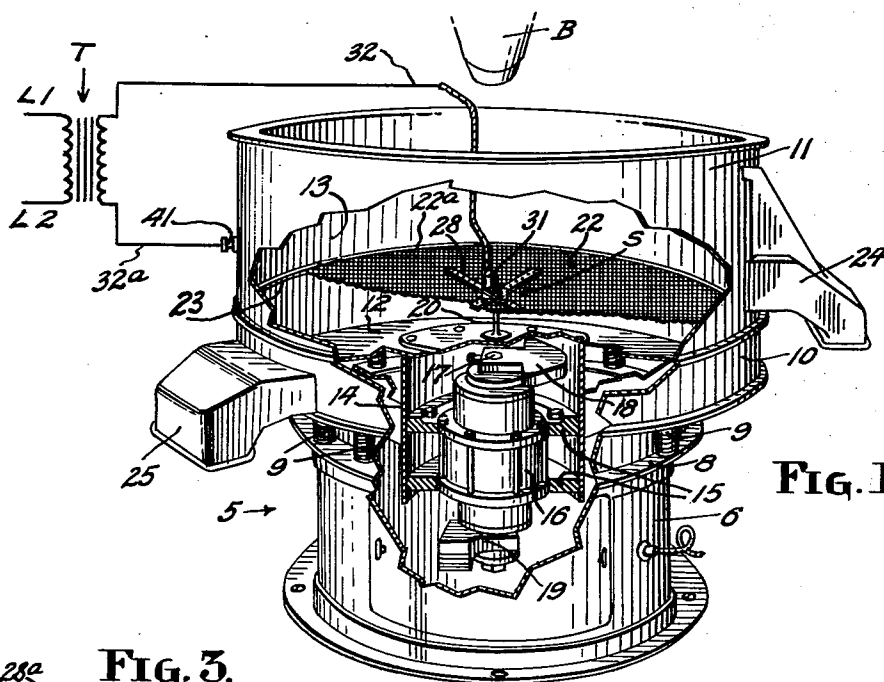


FIG. 1.

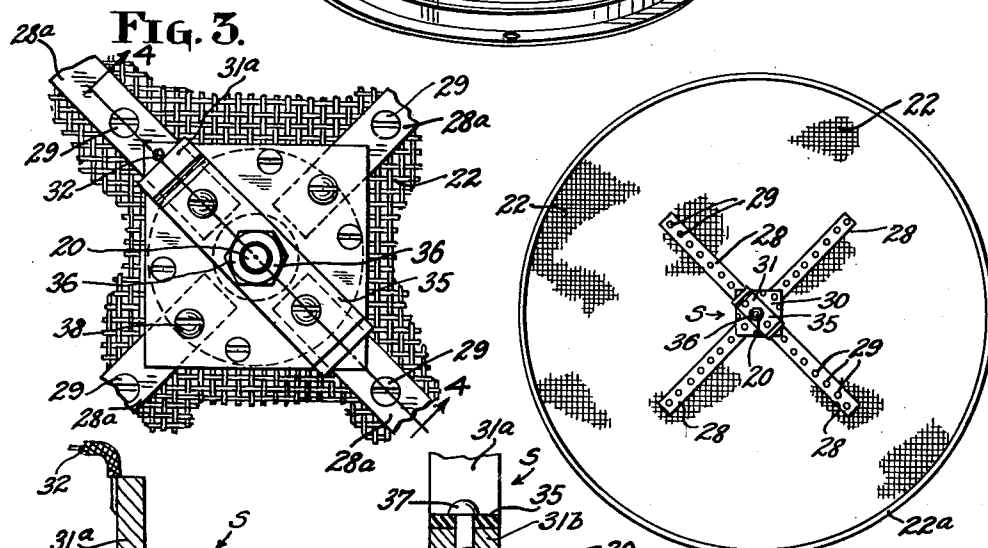


FIG. 2.

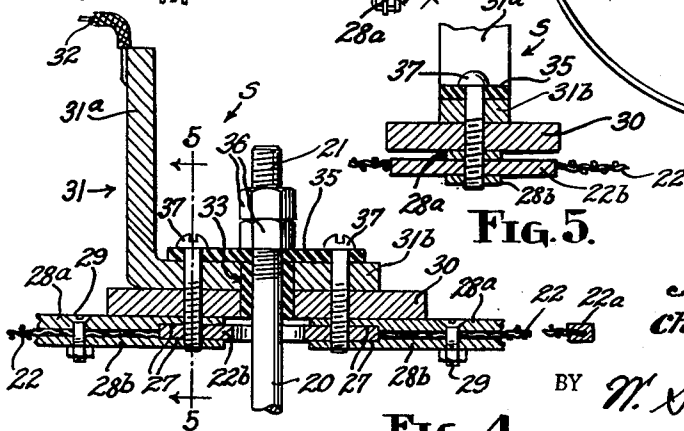


FIG. 3.

FIG. 4.

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TERMINAL CONSTRUCTION FOR ELECTRICALLY HEATED SCREENS OF MATERIAL SEPARATORS

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7 Claims. (Cl. 209—238)

This invention relates generally to screening apparatus of the type employed in separating or classifying divided or comminuted materials based on particle size, and more particularly to an improved means for imparting electrical heating energy to such screening apparatus for the purpose of preventing undesired adherence to and clogging of the openings or interstices of the screening apparatus due to the presence of moisture in the materials being separated.

In the separation or classification of relatively divided, crushed, or comminuted materials such as, for example, stone, sand, grain, and the like, based on particle size, the materials to be separated or classified are usually deposited upon a wire screen member which is vibrated or moved in a manner to permit the particles of material below a given size to pass through the openings or mesh of the screen, to thus separate the smaller size particles from the remaining relatively larger size particles of the materials introduced to the screen.

In the past, it has been found that moisture contained within materials to be separated or classified in this manner often tends to blank out or clog the spaces or openings of the associated screen device to thus prevent or impede the classification or screening operation. It has heretofore been proposed to heat the screens of certain types of material separators by applying electrical current to the wires constituting the screen member, but in instances of which we are aware, the electrical current has been applied to the screens by means of electrodes or terminals disposed at opposed sides or ends of the screen body, with the result that the screen member becomes overheated in certain local regions and insufficiently heated in other regions thereof. It will be understood that under ordinary conditions the materials to be screened or separated are generally introduced or deposited upon the central portion of a screening member. For this reason, it has been found that the application of electrical current through opposed electrodes arranged on opposite sides or ends of a screen cloth does not effectively distribute heat in the regions of the screen cloth where most desired.

Accordingly, it is the primary object of the present invention to provide an improved terminal and electrode structure for material separator screens which is operable to more effectively transmit and distribute electrical heating energy to the wires of the screen, and thereby to apply the most efficient degree of heat to the various areas or regions of the screen.

It is another object of the present invention to provide an improved terminal and electrode structure which is joined with the central portion of a separator or screen so as to direct and distribute electrical current between the central portion of the screen member and the outer marginal edges thereof, to thus insure the most effective heating of the screen member throughout its full area.

A further object of the invention is to provide an electrical terminal and electrode structure which is arranged in the central portion of an associated separator screen,

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and which includes a plurality of outwardly radiating electrodes or bus bars directly and electrically connected with the metallic wires comprising the screen member in a manner to transmit electrical heating energy radially of the screen member between its central portion and the outer marginal edges thereof.

For a further and more detailed understanding of the invention, including additional objects and advantages thereof, reference is made to the following description and the accompanying drawing, wherein:

Fig. 1 is a perspective view of a vibratory material separator having a screen member upon which the present terminal and electrode structure is mounted, portions of the outer casing of the separator being broken away to disclose interior construction;

Fig. 2 is a top plan view of a circular wire mesh screen on which is mounted a terminal and electrode structure formed in accordance with the present invention;

Fig. 3 is an enlarged fragmentary top plan view showing the angular relation of the electrode or buss bars of the present terminal structure to the wires of the screen member;

Fig. 4 is a vertical sectional view taken along the line 4—4 of Fig. 3; and

Fig. 5 is a detailed vertical sectional view taken along the line 5—5 of Fig. 4.

Referring now to the drawing, Fig. 1 thereof illustrates a particular form or type of vibratory material separator and classifier machine which, apart from the particular terminal and electrode arrangement disclosed therein, forms no part of the present invention, but is illustrated for purposes of explanation only. In this instance, the separator machine 5 comprises a stationary, circular base section 6 which is formed adjacent to its upper end with an annular flange 8. Mounted on the flange 8 are a plurality of upright coil springs 9 which provide resilient supports for a vibratory upper casing section 10. The upper section 10 includes an open top, cylindrical housing 11 which is closed at its bottom by a circular table 12, and which defines an internal screening chamber 13. Materials to be classified or separated are introduced to the screening chamber 13 by way of a material feed spout B.

Depending from the central region of the table 12 is a cylindrical shell 14 which carries on its inner wall surface a pair of vertically spaced seating rings 15. Supported on the rings 15 is an electric motor 16 having a vertically arranged armature shaft 17 upon which is carried a pair of radially opposed, unequal weights 18 and 19 which, upon operation of the motor 16, serve to impart vibratory motion to the upper casing section 10 of the machine. Secured to the central portion of the table 12 is a vertically extending stem 20 which is threaded at its upper end, as at 21. The stem 20 passes upwardly through the central portion of a circular screen member 22 which extends horizontally across the screening chamber 13 of the housing 11 intermediate the ends of the latter. The screen member 22 is provided along its perimeter or marginal edge with an annular, metallic, reinforcing ring or band 22a which is seated upon an annular shoulder or ledge 23 formed on the interior of the upper housing. The screen member 22 is further provided at its axial center with an annular, metallic, reinforcing ring 22b. Immediately above and adjacent the upper surface of the screen, the housing 11 is provided with a laterally and exteriorly projecting discharge spout 24 through which the oversize or larger particles of materials pass during separating operations. The housing section 11 is formed below the screen, and adjacent the table 12, with a similar discharge spout 25 through which the smaller or screened particles of materials pass during separating operations.

It will be understood that the apparatus heretofore de-

scribed constitutes a typical type of motor-driven separator or classifier machine in present day use, and as such, forms no part of the present invention.

In accordance with the present invention, we provide upon the central portion of the screen member 22 an electrical terminal and electrode structure generally indicated by the reference character S. The structure S provides a plurality of generally horizontally extending and outwardly radiating electrodes or buss bars 28, each of which is preferably comprised of upper and lower clamping sections 28a and 28b engaging respectively the upper and lower sides of the screen member 22. Preferably, the electrodes or buss bars 28 are formed at their inner ends to provide complementary recesses 27 which are adapted to receive and clamp the metallic center reinforcing ring 22b of the screen member 22. The electrodes or buss bars 28 are formed from a relatively lightweight metal having good electrical conductive properties such as, for example, aluminum, and are maintained in direct electrical engagement with the strands of metal wire comprising the central section of the screen member 22. Preferably, we employ four electrodes or buss bars 28 which are arranged in spaced angular relation to one another (here shown as 90°). Also, to obtain desired optimum heating of the screen member 22, the buss bars 28 should be disposed in angular relation (preferably 45°) to the individual wires or strands of which the screen member 22 is composed. This desired angular relation between the buss bars 28 and the strands or wires of the screen member is disclosed in detail in Fig. 3 of the drawing. The upper and lower sections of the buss bars 28 are secured in clamping relation to the screen member 22 by means of a plurality of radially spaced clamping bolts 29 which extend through suitable openings formed in the upper and lower sections of the buss bars and through suitable openings or spaces provided in the screen cloth comprising the screen member 22. In this connection, care should be taken in applying the sections of the buss bars 28 to the screen member not to break the individual strands or wires of the screen member 22, the latter being merely flexed or spread apart relative to one another sufficiently to accommodate the shanks of the bolts 29.

Mounted in the superposed electrically conductive relation to the inner end portions of the buss bars 28 is a rectangular distributor plate 30 which is also preferably formed from aluminum or an equivalent electrically conductive metal. The distributor plate 30 is formed with a central opening through which the stem 20 passes, and in which is received a tubular dielectric bushing element 34 formed from pressed fiber or the like. Positioned directly upon the upper surface of the distributor plate 30 is an L-shaped terminal bar 31 having a vertical leg portion 31a and a horizontal leg portion 31b. The horizontal leg portion 31b of the terminal bar 31 is formed with a centrally disposed opening 33 through which the stem 20 and the upper portion of the dielectric bushing 34 passes. Positioned across the upper surface of the horizontal leg 31b is a rectangular dielectric insulating pad or block 35 which may be formed of the same pressed fiber material as the bushing 34. The parts or elements of the terminal and electrode structure S are joined together as a unit by means of a pair of screw threaded bolts 37 which pass vertically through suitable openings formed in the insulating block 35, the horizontal leg 31b, the distributor plate 30, the inner ends of the buss bars 28 and the center ring 22b of the screen member, as shown particularly in Fig. 4 of the drawing. Additional locking screws 38 are provided in uniting the distributor plate 30 with the remaining pair of buss bars 28.

Advantageously, at the time of applying the upper and lower sections of the buss bars 28 to the central portion of the screen member 22, a suitable electrically conductive plastic material is applied to the adjoining faces of the buss bars 28 and screen member 22, in order to seal the resultant connection against the introduction of dirt or

other fine particles from the material to be screened. In this manner, the electrical connection between the buss bars 28 and screen member 22 will be maintained against interruption or interference.

The terminal structure S is secured upon the stud 20 by means of a pair of cooperative binding and lock nuts 36 which are tightened downwardly upon the threaded shank 21 of the stem 20. At the same time, these nuts 36 serve to maintain the outer rim portions 22a of the screen members 2 in firm, abutting, and electrical contact with the ledge 23 formed on the inner side wall of the housing section 11.

Electrical current is transmitted to the wires comprising the screen member 22 from a suitable source of electrical energy such as, for example, the secondary winding of a transformer T, electrical current being supplied to the transformer T by way of the power lines L1 and L2. As shown in Fig. 1, a flexible electrical conductor 32 is arranged to extend from one pole of the transformer T to the vertically extending leg 31a of the terminal structure S, the end of the conductor 32 being electrically connected with the leg 31a, as by welding, brazing, soldering, or other suitable means. The opposite pole of the transformer T is connected by way of a lead 32a with a terminal screw 41 directly and electrically connected with the metallic housing 11 which, in turn, is in electrical contact with the screen member 22 by reason of the abutting contact between the outer reinforcing ring 22a and the ledge 23 of the housing section. Through this arrangement, current is caused to pass from the lead 32 through the terminal member 31, through the distributor plate 30 and then to each of the buss bars 28 and into the wires of the screen member 22. The circuit is completed through the reinforcing ring 22a, the metallic housing section 11, contact screw 41, and lead 32a.

In view of the foregoing, it will be seen that the axial or central disposition of the terminal and electrode structure S provides for the efficient distribution of electrical heating current throughout all areas of the screen member 22, while at the same time providing the desired optimum heating of the screen member 22 toward the central area thereof upon which is normally deposited the mass of materials to be screened or separated. During operation of the vibratory apparatus associated with the screen, materials deposited on the central region thereof are caused to flow radially outwardly and in a clockwise direction from the central portion of the screen member and thence outwardly through the discharge spouts 24 and 25. By effectively heating the wires of the screen cloth the materials being screened are largely prevented from clogging or bridging the spaces or interstices between the individual strands or wires comprising the screen member with the result that the separation or classification of such materials is accomplished in a more expeditious and complete manner.

While we have disclosed in detail a single preferred embodiment of the present invention, it will be understood that the same is subject to various modification in regard to details of construction and design without departing from the spirit of the invention or the scope of the following claims.

We claim:

1. In an electrically heated metallic wire separator screen; an electrode assembly comprising a plurality of relatively elongated, angularly related metallic bars connected with and radiating outwardly from the central portion of the screen and disposed in direct electrical contact with the wires thereof; said bars having outer end portions terminating in a distance inwardly from a marginal edge of the screen; a metallic distributor plate electrically joining the inner end portions of said bars; a terminal member electrically connected with said distributor plate and disposed in perpendicular relation to said bars and the screen; and means for electrically connecting said terminal member and a marginal edge of

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the screen to a source of electrical energy, whereby to cause electrical current from said source to flow between the central portion and marginal edge of the screen.

2. In combination with a material separator screen having central and marginal edge portions and comprising a plurality of interwoven metallic wire strands; a plurality of relatively elongated, angularly related metallic electrode bars having inner end portions electrically connected with one another and disposed in direct electrical contact with the wires of said screen at the central portion thereof and having outer end portions radiating outwardly from the central portion of said screen and terminating in relatively widely spaced relation to the marginal edge portion of said screen, each of said electrode bars being arranged in angular relation to the individual wire strands of the screen; a metallic terminal member electrically connected with each of said electrode bars at the inner ends thereof; and means for connecting said terminal member and the marginal edge portion of said screen to a source of electrical energy.

3. The combination as defined in claim 2, wherein the electrode bars are four in number, and the relative angular relation between said bars and the individual wire strands of the screen is approximately 45 degrees.

4. An electrode structure for an interwoven wire strand separator screen comprising: relatively angularly disposed pairs of bar-like contact members radiating outwardly from the central portion of an associated screen, one of each pair of said members having direct contact with one side of the screen and the other member of each pair with the opposite side thereof, the members of each cooperative pair being disposed in vertically aligned, co-extensive, parallel order; threaded fastening means maintaining the members of each pair in clamping engagement with the wire strands of the screen interposed therebetween; and a single terminal member electrically connected with each of said contact members.

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5. An electrode structure as defined in claim 4, wherein said contact members are disposed in relative X-shaped order, and are disposed in angular relation to the wire strands of the screen.

6. Terminal means for applying electrical heating current to a circular wire mesh separator screen, comprising: a body structure mounted axially on the upper portion of such a screen; rigid contact bars radiating in angularly spaced, fixed relation from said body structure in direct intersecting contact with the wire strands of the screen; clamping means in contact with the under portion of said screen for maintaining said bars in positive engagement therewith; and a terminal bracket carried by and extending upwardly from said body structure.

7. Terminal means for applying electrical heating current to a circular wire mesh separator screen, comprising: a body structure mounted axially on the upper portion of such a screen; rigid contact bars radiating in angularly spaced, fixed relation from said body structure in direct intersecting contact with the wire strands of the screen; clamping means in contact with the under portion of said screen for maintaining said bars in positive engagement therewith; a terminal bracket carried by and extending upwardly from said body structure; an insulating member disposed axially of the body structure; a relatively stationary rod extending through said insulating member; and threaded means adjustably carried by said rod for holding said terminal means and the screen associated therewith against movement longitudinally of the rod.

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