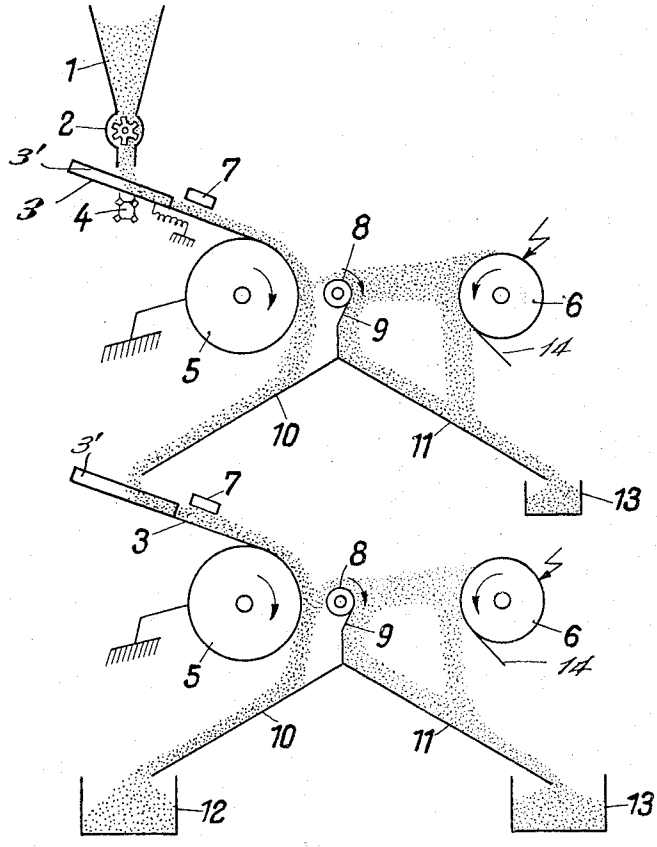
Feb. 23, 1937. G. GRAVE 2,071,460

APPARATUS FOR THE ELECTROSTATIC SEPARATION OF MIXED PARTICLES OF DIFFERENT ELECTRICAL BEHAVIOR

Filed March 1, 1935



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Patented Feb. 23, 1937 2,071,460

UNITED STATES PATENT OFFICE

2,071,460

APPARATUS FOR THE ELECTROSTATIC SEPARATION OF MIXED PARTICLES OF DIFFERENT ELECTRICAL BEHAVIOR

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Application March 1, 1935, Serial No. 8,964
In Germany March 9, 1934

5 Claims. (Cl. 209—128)

This invention relates to apparatus for the electrostatic separation of mixed particles of different electrical behavior, by the aid of a guide surface between the delivery end of which and an electrically charged member is located the electrostatic field effecting the separation.

The present invention aims at substantially facilitating the separation of the mixed particles in the aforesaid process. To this end, according to the invention, the mixed particles are caused to enter a weaker intermediate electrical field before reaching the said electrostatic field.

The hereindescribed apparatus is suitable for any kind of material that is to be separated composed of particles having different electrical properties.

The invention is preferably carried into effect by arranging, between a grounded revolving roller, fed with the material under treatment, and a member charged, preferably with high tension current, more particularly high-tension direct current, a conductor insulated from earth, a semi-conductor or a non-conductor which serves as an intermediate-potential member for the generation of the substantially weaker intermediate field.

In order more clearly to understand the invention reference is made to the accompanying drawing which illustrates diagrammatically and by way of example one embodiment of plant suitable for carrying the invention into practical effect.

In the embodiment shown, the material to be separated is delivered from a feed hopper 1, on to a grounded jig-conveyor plate 3, in a uniform manner by means, for example, of a cellular wheel feeding device consisting of a rotatable, longitudinally channeled rod 2. The jigging motion, which is imparted to the plate 3 by means of a cam-shaft 4, is designed to loosen up the material. In order to prevent the material from collecting together in thick streams at the sides, the plate 3 is provided with dividing ribs 31 disposed in the direction of flow of the material.

From the jig plate 3, the material passes on to a low-speed (preferably vibratory) delivery roller 5 which, like the plate 3, is grounded. An insulated roller 6, mounted a short distance away from the roller 5, is connected with one pole of a generator of constant high-tension direct current. The other pole of the generator is grounded. A static potential field is formed between the roller 6 and the roller 5 together with the plate 3. Consequently, a member 7 located above the plate 3 and preferably consisting of semi-conductive material acquires an intermediate potential. On the material passing through the space between the member 7 and the plate 3, the weak field located in said space effects a preliminary separation of the material, thereby facilitating the subsequent separating operation. Light particles are attracted from the material by the member 7 and, after reversal of their charge, drop back loosely on to the material passing over the inclined conveyor plate 3.

As soon as the material reaches the roller 5, lighter particles fly direct to the high-tension roller 6, where they experience a reversal of charge and tend to fly back to the roller 5. In order to prevent this, the particles are removed from the powerful electrical field. This is effected by rotating the roller 6 in the direction of the arrow, that is, in the opposite sense to the direction of rotation of the roller 5, so that the adherent particles drop down outside the electrical field, or are scraped off by a scraper 14.

Arranged in the field between the rollers 5 and 6 is a smaller and more rapidly rotating roller 8, of insulating material, or of conductive, or semi-conductive material insulated from earth. This roller 8, in conjunction with the scraper 9, forms a partition preventing the return of the separated material. The roller 8, which forms an intermediate-potential member and rotates in the same sense as the roller 5, is shifted, in relation to the roller 5 in accordance with the grain size of the material under treatment. A portion of the material to be separated flies upwards on to the roller 8 and from thence on to the roller 6. At the narrowest passage between the rollers 5 and 8, that portion of the material which is more difficult to separate is attracted by the insulated roller 8, and is brought, by the more rapid rotation of said latter, out of the sphere of action of the field between rollers 5 and 8, into the field between rollers 8 and 6. In this latter field, a portion of the adherent material is attracted by the roller 6, the remainder being removed by the scraper 9. The separated components of the material pass over the inclined surfaces 10, 11 into the receptacles 12, 13.

According to the nature and grain-size of the material under treatment, the separation is more or less incomplete, so that a further treatment is advisable which can be performed successively in one or more lower stages, as shown in the drawing. By graduating the voltage a larger or smaller number of particles can be removed

from the material under treatment, according to the degree of separation required.

Of couse, it is also possible to apply to the intermediate-potential member 8, a separate voltage which is correspondingly lower than the potential of the roller 6.

I claim:—

1. Apparatus for the electrostatic separation of mixed particles of different electrical behaviors comprising a grounded conductive carrier for the particles, a high potential electrode spaced from said carrier and an insulated non-conductive roller interposed between said carrier and said high potential electrode.

2. Apparatus as defined in claim 1 in which the carrier comprises a revolving roller and in which the insulated non-conductive roller interposed between said high potential electrode and said carrier rotates in the same direction as the carrier roller.

3. Apparatus as defined in claim 1 in which the carrier comprises a revolving roller and in which the high potential electrode is a roller revolving in the opposite direction.

4. Apparatus as defined in claim 1 in which the carrier comprises a revolving roller, the high potential electrode is a roller revolving in the opposite direction and the insulated non-conductive roller revolves in the same direction as the carrier roller.

5. Apparatus as defined in claim 1 in which the carrier comprises an inclined plate and a roller and in which an intermediate potential member is disposed above said plate.

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