J. KRAUS.

ELECTROSTATIC APPARATUS FOR SEPARATING AND CLEANING GRITS, GRAIN, OR THE LIKE.

APPLICATION FILED JULY 10, 1913.

1,179,936.

Patented Apr. 18, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

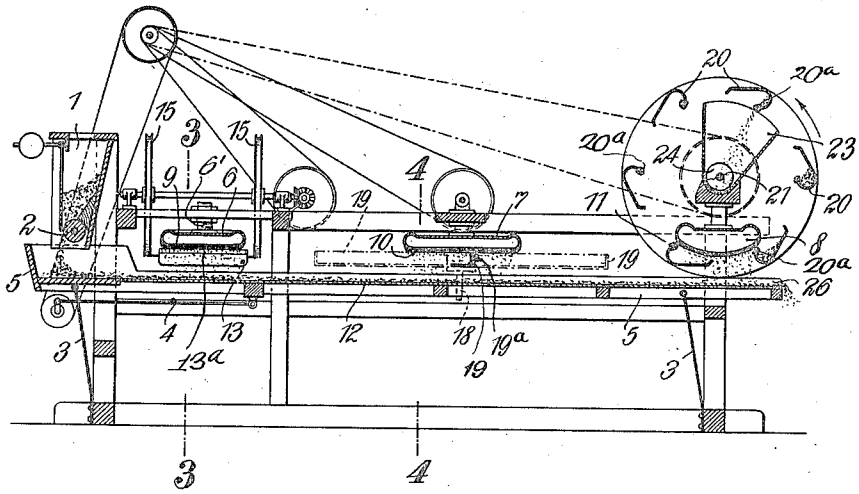
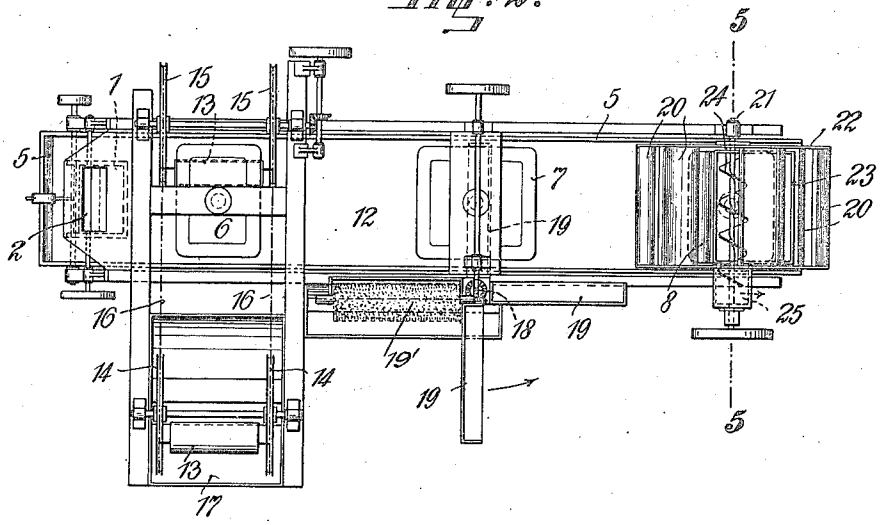


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

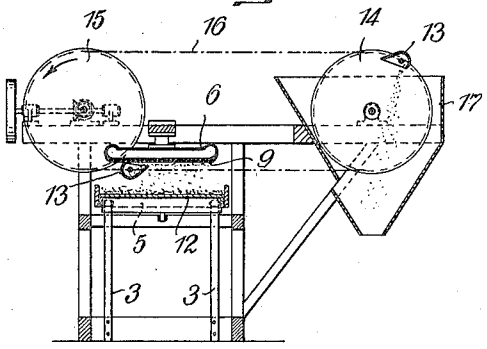


Fig. 4.

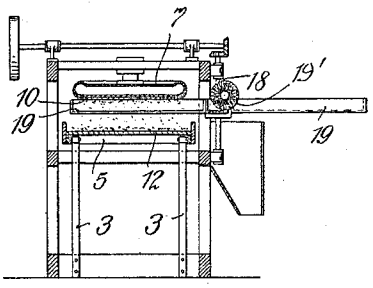


Fig. 5.

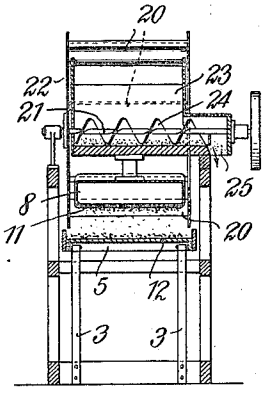
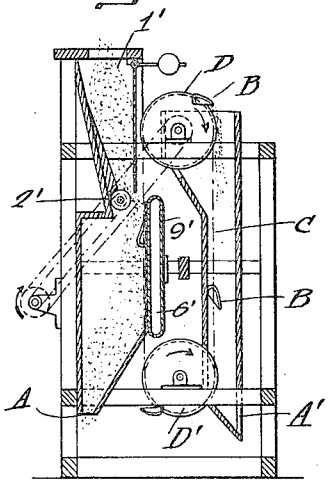


Fig. 6.



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UNITED STATES PATENT OFFICE.

JAKOB KRAUS, OF BRUNSWICK, GERMANY.

ELECTROSTATIC APPARATUS FOR SEPARATING AND CLEANING GRITS, GRAIN, OR THE LIKE.

1,179,936. Specification of Letters Patent. Patented Apr. 18, 1916.

Application filed July 10, 1913. Serial No. 778,261.

To all whom it may concern:

Be it known that I, JAKOB KRAUS, a subject of the German Emperor, and resident of Brunswick, Germany, have invented certain new and useful Improvements in Electrostatic Apparatus for Separating and Cleaning Grits, Grain, or the like, of which the following is a specification.

My invention relates to electrostatic apparatus for separating and cleaning grits, grain or the like in which the attracting pole in the electrostatic field is covered or surrounded by a dielectric.

It has been proved that in an electrostatic field husk particles are lifted out and drawn to an attracting pole from grits, husk particles and withered grain from sound grain and fibers from sugar and the like. The pole must be however covered with a dielectric as otherwise the particles of material attracted are thrown back by the pole immediately after they come into contact with it. On this known fact is based my improved apparatus in which, between the material to be cleaned and the attracting pole of the electrostatic field, is arranged a movable dielectric which is at the same time utilized for carrying away the particles of material separated. In apparatus for carrying out my invention the particles separated can however only be discharged at those points which can be reached by the dielectric in its travel. If, for instance, a conveyer band of rubber is used as a dielectric the material separated thereby can only be delivered at points situated in close proximity thereto. There are, however, cases in which it is desirable to deliver the separated particles of material at a point situated outside the path of the dielectric and to that end, according to my invention a fixed, as opposed to a movable dielectric is used from which start the conveying elements.

When the attracting pole is covered or surrounded with a fixed or stationary dielectric, the particles of material attracted cover the dielectric and must be removed therefrom by stripping off devices of some kind. These stripping off devices must pass through the electrostatic field under the dielectric and then deliver the material stripped off, outside the electrostatic field at the desired point. Such stripping off devices may be in the form of sharp-edged ribs or battens provided with bristles which pass in a rectilinear or curved direction in front of the pole covered with dielectric, and are deprived of the particles carried away, at the point of delivery outside the dielectric.

For the purpose of gradually separating particles some of which are more easily attracted than others, the arrangement is preferably such that the material to be cleaned is carried through two or more electrostatic fields, so that first the lighter and gradually the less light, particles are separated from the heavier particles of the material.

One construction of a grits cleaning machine according to my invention is diagrammatically illustrated by way of example in the accompanying drawing, in which—

Figure 1 is a longitudinal section. Fig. 2 a plan of the machine. Fig. 3 a vertical section on line 3—3 of Fig. 1. Fig. 4 a vertical section on line 4—4 of Fig. 1. Fig. 5 a vertical section on line 5—5 of Fig. 2; and Fig. 6 is a vertical section showing another form of my invention.

The grits to be cleaned pass through a hopper 1 into the machine and, preferably after passing a feed roll 2 reach the upper end of a vibrating tray 5 mounted on supports 3 and reciprocated in the well known manner by a crank drive 4. The grits are distributed in a thin layer on the tray and by the movement of the latter are, in the construction of the machine illustrated, carried consecutively through three electrostatic fields, the attracting poles of which are constituted by electrodes 6, 7 and 8 arranged at a distance above the vibrating tray, and covered or surrounded with a dielectric (non-conductor) 9 or 10 or 11, for instance of vulcanized rubber. The electrode forming the repelling pole, is in the form of a metal plate 12 (of zinc or the like) covering the vibrating tray 5.

The electrostatic field can be generated in any well known manner by means of a static induction machine or by converting high pressure currents or by friction between the electrodes and a dielectric.

The husk particles drawn by the elec-

trodes 6, 7, 8 from the grits passing in front of the same, adhere to the dielectrics 9, 10 and 11 and must be removed from the same by separate means to prevent them from completely covering the attracting surfaces of the electrodes and thus affecting their action.

In the construction of the machine illustrated, different stripping off devices are arranged for the electrodes 6, 7 and 8 placed at intervals behind one another. The device coöperating with the electrode 6 comprises elongated collecting boxes 13 secured to bands 16 passing over rollers 14 and 15. The boxes are moved by the rollers 14, 15 driven in a suitable manner and by the bands 16 passing over the same, in a direction at right angles to the travel of the vibrating tray 5, and come consecutively into contact with the dielectric 9 of the electrode 6 and take up the husk particles adhering to the dielectric. The husk particles carried away by the boxes 13, are delivered outside the electrostatic field into a discharge trough 17. At the second electrode 7, the husk particles adhering to the dielectric 10 are stripped off by a horizontal spider 19 rotatable about a spindle 18, the arms of this spider slowly passing through the electrostatic field and consecutively coming into contact with the lower face of the dielectric. The husk particles taken up by the arms of the rotating spider 19 are removed therefrom outside the electrostatic field by brushes 19′ or the like. The stripping off devices 20 at the third electrode are in the form of buckets and are secured to the circumference of a disk 22 rotatable about a spindle 21. The disk or pulley 22 is arranged opposite the electrode 8 the lower face of which is so covered with a curved dielectric 11 that during their rotation, the stripping off devices 20 consecutively come into contact with the lower face of the dielectric 11 and carry away the particles adhering thereto. These particles are delivered at the top into a channel 23, on the bottom of which is arranged a worm conveyer 24 by which the particles collected can be discharged laterally in the direction of the arrow (Figs. 2 and 5) through an opening 25. The cleaned grits escape from the machine through the outlet 26 while the lighter and heavier husk particles are separated from the electrodes 6, 7 and 8, and carried out of reach of the electrostatic field by the stripping off devices coöperating with these electrodes.

The dielectrics 9, 10 and 11 need not rest directly on the corresponding electrodes 6, 7 and 8, but may be arranged at a slight distance from the same. The edges or surfaces of the stripping off devices 13, 19 or 20 coming into contact respectively with the dielectrics 9, 10 or 11, are preferably provided with bristles or covered with cloth as indicated at 13^a, 19^a, and 20^a respectively in order to strip off the particles adhering to the dielectrics in an efficient manner.

The distance of the electrodes 6, 7 and 8 from the path of the material to be separated, that is to say, from the lining 12 of the vibrating tray 5 can be made adjustable (as by the screw-and-nut connection shown at 6′ for the electrode 6) for the purpose of regulating the strength of attraction. Instead of the vibrating tray shown in the drawing other conveying means may be used for distributing and moving the material. The arrangement may also be made in such a manner that the material to be separated is caused to fall freely in front of the dielectric in the form of a stream or shower. Such a modified arrangement is shown in Fig. 6, where the parts 1′, 2′, 6′, and 9′ are substantially the same as parts 1, 2, 6, and 9 of Fig. 1, but the parts 6′, 9′ are disposed vertically instead of horizontally. The sound grain is discharged at A, while the husks or other attracted particles are stripped off the dielectric covering 9′ by scrapers or buckets B carried by a conveyer C passing over pulleys D, D′; the material thus stripped off is discharged at A′.

What I claim is:—

1. In an electrostatic apparatus for separating and cleaning grits, grain, seeds or the like, the combination with electrodes forming the attractive and repelling poles of the electrostatic field respectively, of a stationary dielectric covering the electrode of the attractive pole, and of movable stripping off devices coöperating with said dielectric.

2. In an electrostatic apparatus for separating and cleaning grits, grain, seeds or the like, the combination with electrodes forming the attractive and repelling poles of the electrostatic field respectively, of a stationary dielectric covering the electrode of the attractive pole, and of movable stripping off devices coöperating with said dielectric and passing alternately through an electrostatic field and neutral zone.

3. In an electrostatic apparatus for separating and cleaning grits, grain, seeds or the like, the combination with a group of electrodes forming the attractive poles and an electrode forming the repelling pole of the electrostatic field respectively, of stationary dielectrics each of said dielectrics covering one of the attractive electrodes and movable stripping off devices coöperating with said dielectrics.

4. In an electrostatic apparatus for separating and cleaning grits, grain, seeds or the like, the combination with a group of electrodes forming the attractive poles and an electrode forming the repelling pole of

the electrostatic field respectively, of stationary dielectrics each of said dielectrics covering one of the attractive electrodes and movable stripping off devices coöperating with said dielectrics, said devices passing alternately through an electrostatic field and a neutral zone.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JAKOB KRAUS.

Witnesses:
CARL KÄMPE,
WILLIAM GREGORINS.