Feb. 15, 1927. 1,617,971

G. ULLRICH

MAGNETIC SEPARATOR

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Fig.1.

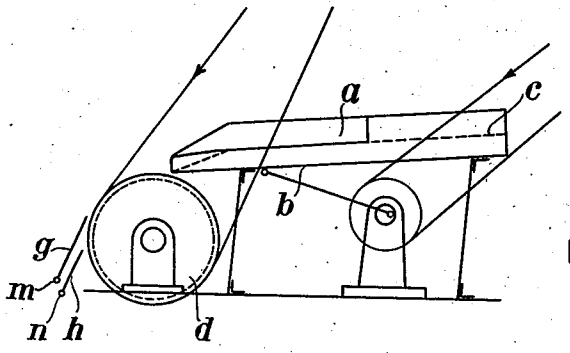
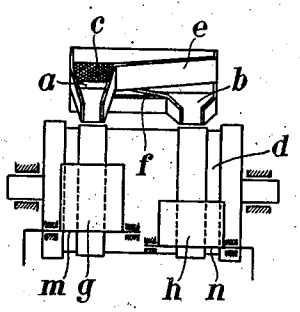


Fig.2.



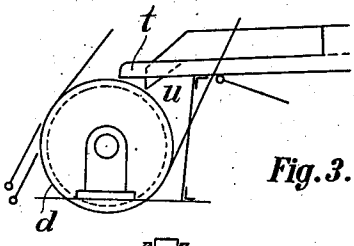
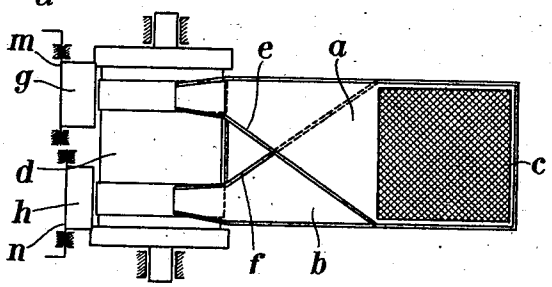


Fig.6

Fig.3.



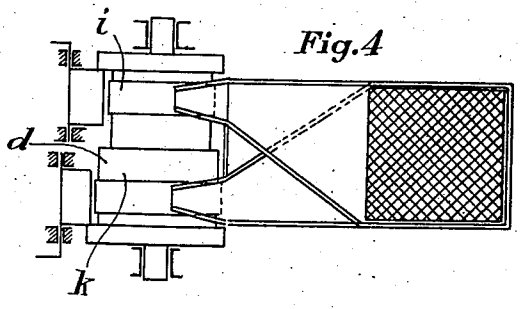
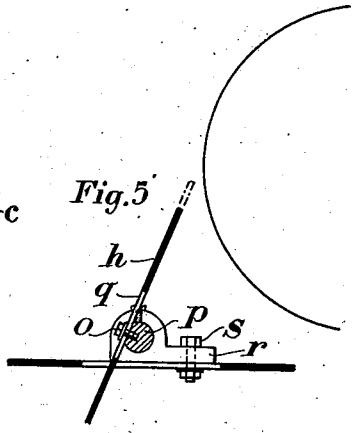


Fig.4

Fig.5



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Fig. 7

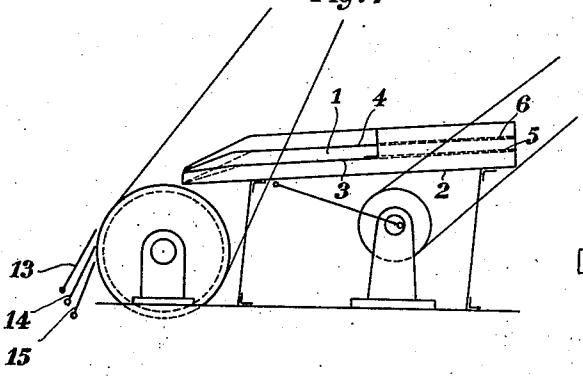


Fig. 8

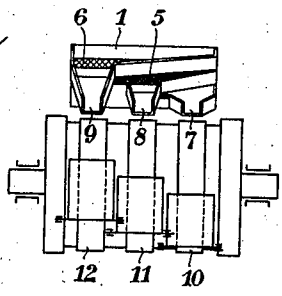
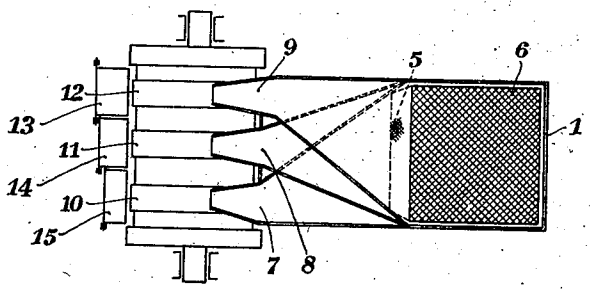


Fig. 9



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1,617,971

UNITED STATES PATENT OFFICE.

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MAGNETIC SEPARATOR.

Application filed February 28, 1925, Serial No. 12,286, and in Germany September 23, 1920.

The invention deals with a process for the magnetic separation of crude material of various size of grains. In order to be in a position to treat various sizes of grains it was hitherto either necessary to use several separating contrivances each of which in conformity with its peculiarity could only be adapted to a special size of grains, or, if only one separator is working, the various sizes of grains had to be treated on same, one after another. The former process makes it necessary to provide several separators increasing thereby considerably the cost-price and the costs of running the plant. This is especially of great importance for plants in which only comparatively small quantities of such material are treated. The second process requires after the kinds of grains have been separated a single treatment of each size of grains, one after another. It must then be kept in view, i. e., for drum-separators rotating at uniform speed of the moved separating surface that each kind of grains drops off or is thrown off at a special angle. It would therefore either be necessary to adjust especially for each kind of grains the catching devices for the material, or the speeds of rotation of the separating surface, or both. It is obvious that though said process is cheaper than the former, it is rather circumstantial, wearisome and less productive.

All the aforesaid disadvantages can be removed by the process dealt with by the invention. By the new process several kinds of grains can be treated side by side on a common separating surface or on two or more separating surfaces set in motion together, whilst the separation of the several streams of material into magnetic and non-magnetic material is effected independently.

It will be expedient to use drum-separators for the simultaneous separation of various sizes of grains, but other separators with moved separating surface, i. e. band-separators may likewise be used. When using drum-separators the streams of materials containing the several sizes of grains are charged side by side into the drum-separator. For each stream of material one provides on the side where the material drops a special metal sheet, where the material is caught, being adjustable according to requirements.

Instead of a single drum to be used for all streams of material in common one can arrange likewise side by side several drums which are set in motion together. One can likewise graduate the drums in such a way, that they vary in diameter within the touch of the various streams of material. In the same way the drums when set in motion together can be graduated as to diameter one against another. This may be expedient if the sizes of material differ very much so that with the same diameter of the drum the angle in which the sizes of material drop becomes too unlike. In the various grades the speed at the circumference varies and the difference in the angle of the drop of the various streams of material is considerably diminished, so that by adjusting simultaneously the several partition walls a very pure separation of the magnetic and of the non-magnetic material can be attained.

In order to save manual labour one may use for the separation as well as for the separate admission of the sizes of material a feeding table (for common use) provided with two or more table surfaces placed one below another. Each of said table surfaces with the exception of the lowest one, is provided with a screen, the width of mesh of said screens decreasing from top to bottom. All table surfaces are provided with guiding mechanisms (discharge ends) which are directed in such a way that the sizes of grains wandering over the several table-surfaces are charged side by side on the separating surfaces. This can also be arranged in such a way that the spouts of the table-surface discharges are at various distances from the vertical axial centre line of the drum-separator, in order to be able when e. g. treating two different sizes of grains to feed the finer particles of material in about the vertex of the drum and the coarser particles below the vertex, i. e. in the upward moving path of the drum. By feeding the coarser particles in such a way it is attained that the magnetic particles of

same already adhere close to the drum before arriving on the discharge side of the drum, when it is less easy to throw them off.

In the drawing a drum-separator suitable for the execution of the new process is shown by way of example viz, in—

Fig. 1 in lateral elevation, Fig. 2 in front elevation, Fig. 3 in plan, elevation, Figs. 4 and 6, with modifications, while Fig. 5 shows the adjustable partition.

Fig. 7 is a side elevation of a further modified form of the magnetic separator shown in Fig. 1.

Fig. 8 is a front view thereof, and

Fig. 9 is a plan view thereof.

In accordance with the represented example, the crude material is charged on an oscillating table fitted with two table surfaces *a* and *b* arranged one below the other. The crude material drops in the first instance into the upper table surface "*a*" which is transformed into screen "*c*" at the charging-spot. The two streams of material wander across the table surfaces *a* and *b* to separating drum "*d*". By means of the guiding mechanisms (discharges) *e f* the two currents of material are conducted in such a way that they reach the separating surfaces of drum *d* side by side. At the side of drum *d* where the material drops the partition walls *g* and *h* are provided for the purpose of separating the magnetic and the non-magnetic stuff.

As mentioned above, when the seperating surfaces are arranged on the same drum, it may be desirable to regulate the throw of these surfaces by differentiating their circumferential extents. Thus, in Fig. 4, the drum *d* is graduated so that the separating rings are of different diameter. The coarser material will thus be fed to the separating surface *i* while the finer material will be fed to the surface *k*, as explained.

Substantially the same effect may be secured by the adjustment of the spouts, as shown in Fig. 6, according to which the finer grains are fed by the spout *t* to its associated separating ring near the top thereof, while the coarser particles are fed by means of the spout *u* to its associated separating ring at a point substantially below the vertex of the ring on its ascending surface.

As the example for demonstration purposes represents a drum with absolutely uniform diameter, it follows that the speed at the circumference of the separating surfaces is identical for both streams of material. Owing to said two streams being made up of stuff of reciprocally varying size, it is obvious that they drop off at different heights and are thrown off respectively at different angles. This is complied with by each partition wall being placed in special bearings and being adjustable. According to Figs. 2, 3 and 4 only an adjustment by rotating around a single axis (*m* and *n*) is provided. But the rotary partition walls can likewise be adjusted in another manner by themselves or including their rotary axis. Each partition wall can e. g. be arranged to slide in guide-arms located on the rotary axis or a second sheet arranged to slide on the main sheet may be provided for lengthening each partition wall. Each rotary axis may e. g. be placed on a sliding ground plate which can be fixed at various distances from the drum. Thus, according to Fig. 5, the partition wall *h* is provided with a slot or slots *q* and attached to an axle *p* by means of set screw *o* extending through the slot. A radial adjustment of the wall relative to the axle *p* is thus permitted by loosening screw *o*. The axle *p* is journaled in a bearing *r* and is rockable in said bearing upon the loosening of the set screw, as shown. The bearing *r* at the same time is slidable transversely to the axis of the drum in a slot provided in its associated base plate upon the loosening of bolt *s*. The separation into sizes of grains may of course be attended to beforehand so that these are then conducted side by side to the separating drum, so that the screens on the upper table surface can be dispensed with.

In the embodiment shown in Figs. 7 to 9 the sifting and delivery device 1 consists of the superimposed table surfaces 2, 3, and 4. Each of the table surfaces 3 and 4 is provided with a sieve 5 and 6 respectively. The two sieves are of different sized mesh. From the three table surfaces 2, 3, 4 chutes 7, 8, 9 lead to the separating surfaces 10, 11, 12, so that three different streams of material can be simultaneously but separately separated by the magnetic separator. The material to be separated is dumped upon the sieve 6 of the uppermost table surface 4. The coarse material not falling through the sieve then runs down the chute 9 onto the separating surface 12. The material passing through sieve 6 falls upon the sieve 5 of table surface 3. The fine material passing through sieve 5 falls upon table surface 2 and passes through chute 7 onto the separating surface 10, while the material retained by sieve 5 is conducted by chute 8 onto the separating surface 11. The partition walls 13, 14, 15 conduct the non-magnetic material falling from the separating surfaces away.

Claims:

1. A magnetic separator comprising, juxtaposed coaxially arranged rotating magnetic separating surfaces, means for grading the materials to be separated according to size of grains and feeding the granular material as to size in separate streams to the separating surfaces, said means for grading comprising a plurality of table surfaces placed one above another, screens in all said table surfaces except the bottom one, and

a guide chute from each of said table surfaces for feeding the material from the table to one of said magnetic separating surfaces.

2. A magnetic separator comprising, juxtaposed coaxially arranged rotating magnetic separating surfaces, said surfaces being graduated, means for classifying the material to be separated according to size, means for feeding the granular material as to size in separate streams to the separating surfaces, the number of which corresponds to the number of streams of the material to be separated.

3. A magnetic separator comprising, juxtaposed coaxially arranged rotating magnetic separating surfaces, said surfaces having different diameters, means for classifying the material to be separated according to size, means for feeding the granular material as to size in separate streams to the separating surfaces, the number of which corresponds to the number of streams of the material to be separated.

In testimony whereof the foregoing specification is signed.

DR. ING. H. C. GEORG ULLRICH.