No. 707,088. Patented Aug. 19, 1902.

A. DINGS.

MAGNETIC SEPARATOR.

(Application filed Apr. 8, 1901.)

(No Model.)

Fig. 1.

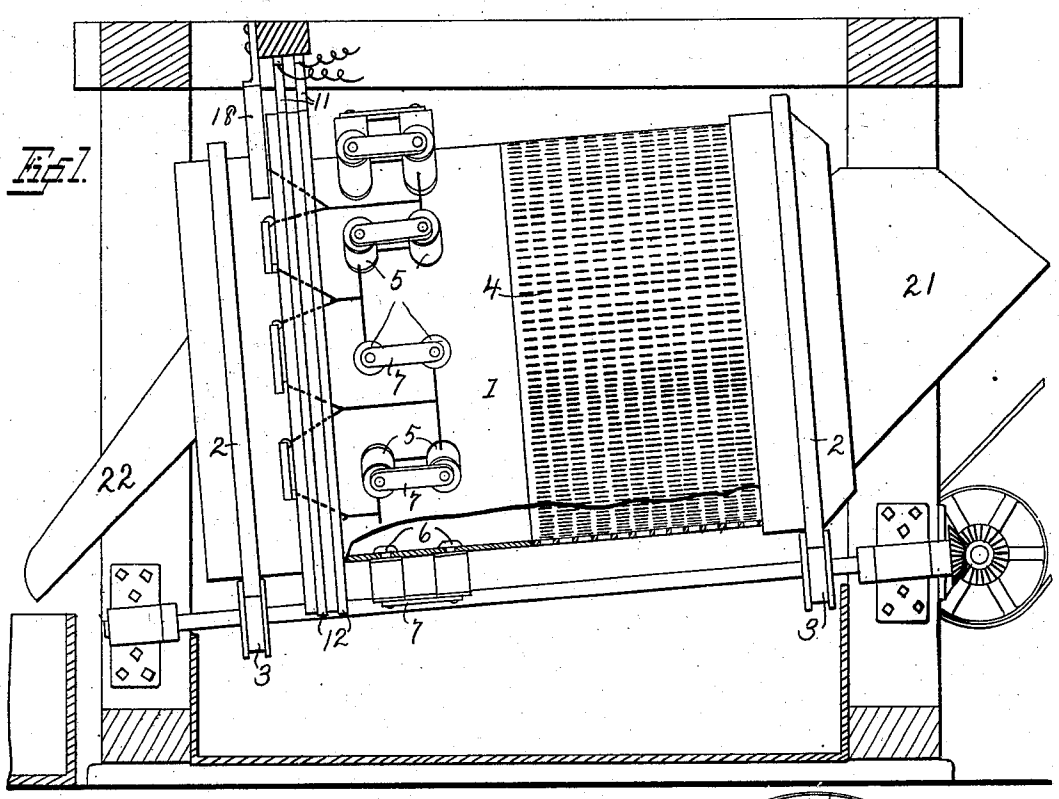


Fig. 2.

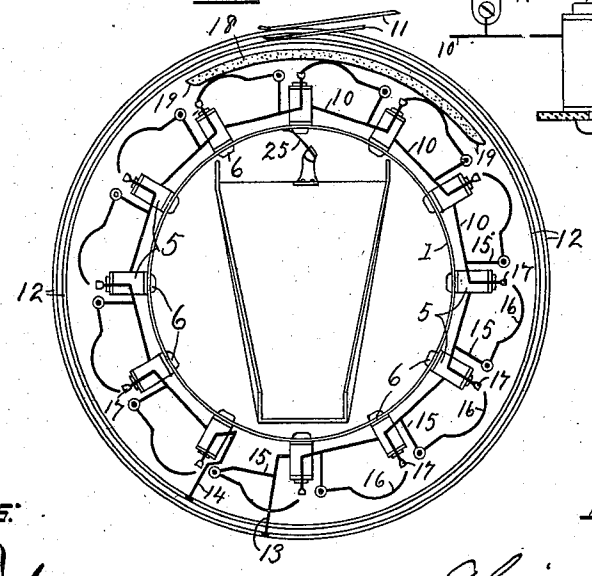
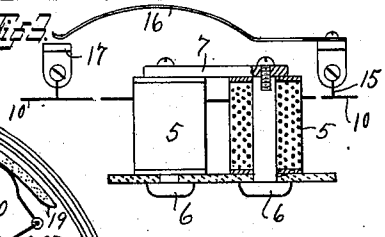


Fig. 3.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ALVIN DINGS, OF MILWAUKEE, WISCONSIN.

MAGNETIC SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 707,088, dated August 19, 1902.

Application filed April 8, 1901. Serial No. 54,771. (No model.)

To all whom it may concern:

Be it known that I, ALVIN DINGS, a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Magnetic Separators, of which the following is a specification.

My invention relates to improvements in that class of magnetic separators in which the material is first brought into direct contact with a magnetic carrier and the non-magnetic material then permitted to fall away from such surfaces prior to the removal or discharge of that which is held to the carrier by magnetic force.

The object of my invention is to provide means whereby the machines of this class may be rendered continuous in their operation and whereby the material will be subjected in passing to the action of a plurality of magnetic poles, so that in case any of the attracted material should by reason of its momentum or for any other cause fail to be held by one of the magnetic poles it would be caught and held by the next.

A further object of my invention is to provide means whereby the material may be continuously separated within a closed cylindrical conveyer and separately discharged to the exterior, thus rendering the structure exceedingly compact and simple in design.

In the following description reference is had to the accompanying drawings, in which—

Figure 1 is a side elevation of my invention, partly broken away. Fig. 2 is a diagrammatical end view of the same. Fig. 3 is a detail view of one of the magnets and its short-circuiting switch.

Like parts are identified by the same reference characters throughout the several views.

1 is a rotating cylinder formed of non-magnetic material and provided with annular ribs or flanges 2 near each end, which rest upon driving-pulleys 3, the latter being so located as to support the cylinder in an inclined position, as shown in Fig. 1. The use of the pulleys 3 and flanges 2 for supporting the cylinder enables me to dispense with an axially-supporting shaft, thus leaving the central portion of the cylinder free and unobstructed. The upper or front end of the cylinder is formed with a peripheral screen 4, while the lower or rear end is provided with an annular row of electromagnets 5, located on the outer surface of the cylinder, with inwardly-projecting pole-pieces 6. The electromagnets are preferably of the horseshoe type, with the two legs alined longitudinally of the cylinder, to which they are secured by means of headed rods, which are inserted from the interior of the cylinder through suitable apertures in its periphery and through the windings of the magnet and screwed into the yoke 7 thereof, the rods forming the magnet-cores and the heads of the rods being of larger diameter than the apertures in the cylinder, so that they not only serve to form the inwardly-projecting pole-pieces of the magnets, but also hold the magnets in position on the cylinder, as shown in Fig. 3.

The magnets are connected in series by means of conductors 10, as illustrated in Fig. 2, and are energized from any suitable source of electric power through the medium of the brushes 11, annular conducting-rings 12, located on the periphery of the cylinder, and the conductors 13 and 14 leading from the respective rings to the initial and terminal magnets of the series. Each conductor, which is directly connected with one of the magnets, is provided with a shunt 15, having electrical connection with a yielding switch 16, preferably of spring metal and which is adapted when subjected to pressure to be brought into contact with an electrode 17, which is electrically connected with a conductor of similar polarity leading to the next succeeding magnet. In other words, the conductor 13 is provided with the shunt 15 and switch 16, so arranged that when the latter is brought into contact with its corresponding electrode 17 a direct electrical connection will be made between the conductor 13 and the conductor 10 between the initial and next succeeding magnet of the series, the initial magnet being thus short-circuited. The next succeeding magnet may be similarly short-circuited by means of the next succeeding switch, and so on throughout the series.

For operating the short-circuiting switches 16 I have provided a segmental shoe 18, which is located above the cylinder 1 and with which the switches are successively brought into contact as the cylinder is rotated. The

ends 19 of the shoe and the free ends of the switches are oppositely curved or faced, so that when these parts are brought into contact the ends of the switches will be forced inwardly by the shoe into contact with their respective electrodes 17. With this construction the uppermost magnets of the cylinder will always be short-circuited while passing underneath the shoe 18'.

The material is fed into the cylinder at its upper or front end by means of a hopper 21, and as the cylinder is rotated the dust and finer particles of the material will be sifted out through the screen 4, while the remaining material slowly passes toward the front end by the action of gravity. As the material passes the magnets the magnetically-attracted particles adhere to the pole-pieces, while the remaining particles are permitted to pass and drop from the lower portion of the rear end of the cylinder. The material attracted by the magnets, however, is carried upwardly with the revolution of the cylinder until the magnets holding such material are short-circuited through the medium of their corresponding switches 16, as heretofore described, when the magnets will be deënergized and the material permitted to drop into a chute 22, by which it is conveyed to any suitable point of discharge.

As there is no axially-supporting shaft for the cylinder 1 the chute 22 may be easily inserted into the cylinder in a position to receive all the material discharged by the short-circuited magnets.

While other means for deënergizing the magnets may be employed, such as switches or commutator bars or brushes, without departing from the scope of my invention, yet the short-circuiting switches are preferred for this purpose, as it enables me to connect the magnets in series, which makes it practical to wind them for available commercial voltages without using expensive fine wire. The use of the segmental shoe enables me to apply such devices to a rotary cylinder, and the current is thus absolutely continuous and subject to substantially the same resistance. I also attach great importance to the use of the rounded pole-pieces 6, which are incapable of supporting non-magnetic material, but which consist of the ends of the magnet-cores and are easily rendered strongly magnetic.

If desired, suitable brushes 25 may be employed to facilitate the removal of the material from the deënergized magnets in case any of it should adhere thereto on account of the residual magetism, oil, or dampness.

It will also be understood that it is not absolutely necessary that the pole-pieces of the magnets should project into the interior of the cylinder, although this construction is preferred, as it is much easier to hold the attracted material when in direct contact with the magnets. I attach great importance to the fact that in my device the material is first brought into direct contact with the surfaces to which it is to be held and the non-attracted material subsequently permitted to fall away.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a rotary, open-ended, non-magnetic cylinder; a series of electromagnets mounted thereon; magnet-cores extended through the cylinder and provided with rounded heads on the interior surface thereof; annular conducting-rings located on the cylinder; and brushes for connecting the same with a source of electrical energy, said magnets being electrically connected in series with rings; a resilient bar for each magnet also electrically connected with the rings, and adapted to serve as a shunt for its corresponding magnet when in contact with a terminal beyond such magnet; and a segmental shoe located in the path of the bar and adapted to force the bar downwardly into contact with the terminal when passing the shoe, said bar being normally out of contact with the terminal.

2. The combination with a diagonally-disposed, rotary, non-magnetic cylinder; of a cylindrical screen forming a continuation thereof, at its upper end; an annular series of electromagnets exteriorly disposed around its lower end; conducting-rings connected with a source of electrical energy, and electrically connected with the magnets; and circuit-controlling mechanism adapted to energize and deënergize the magnets successively, each of said magnets being provided with a core extending through the cylinder, and headed on the interior surface, said core and head being integral, and the head being rounded or semispherical in form, whereby it not only serves to hold the magnet in position, but also concentrates the magnetic force over a small surface exposed to the material passing through the cylinder.

3. The combination with a rotary, non-magnetic cylinder provided with an annular row of magnets, and conducting-rings adapted to convey an electrical current through the magnets; of a series of resilient bars, each member of which is connected with the circuit on one side of one of the magnets; a terminal located in the circuit, on the other side of each magnet, and normally out of contact with its corresponding bar; and a segmental guide-shoe arranged in the path of the bars, and adapted to force them into contact with their terminals; said bars being arched and arranged for angular sliding contact with the guide-shoe.

In testimony whereof I affix my signature in the presence of two witnesses.

ALVIN DINGS.

Witnesses:
JAS. B. ERWIN,
LEVERETT C. WHEELER.