R. D. PIKE.

MAGNETIC SEPARATOR.

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1,233,804. Patented July 17, 1917.

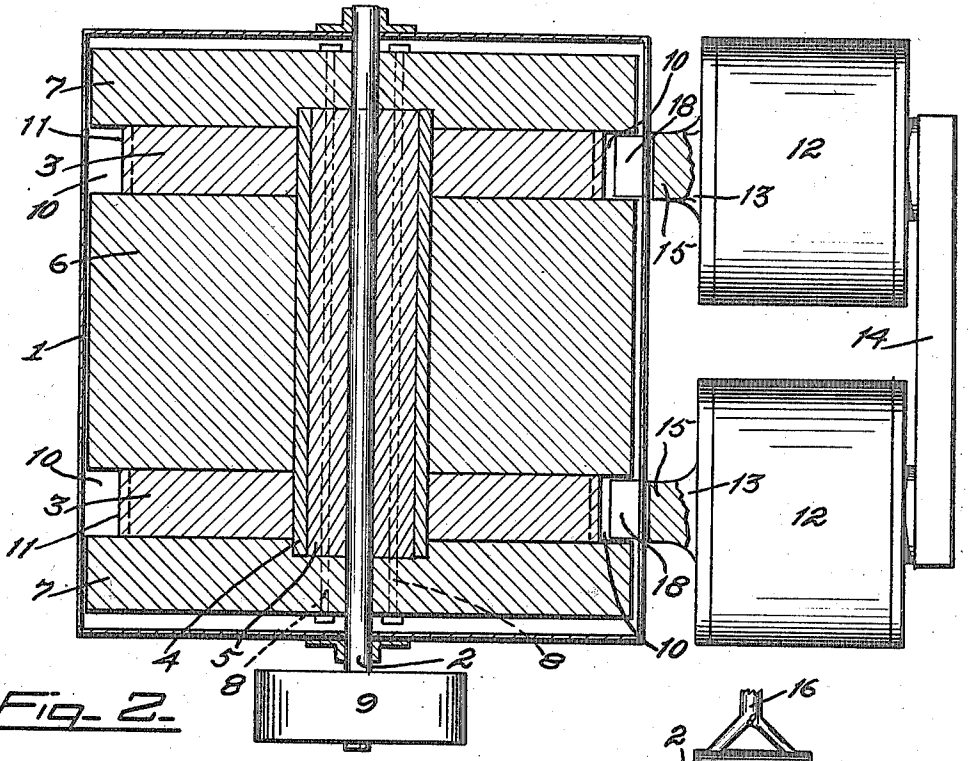


Fig. 2.

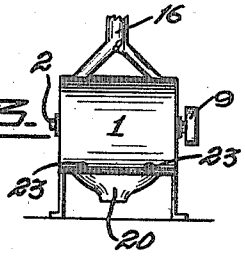


Fig. 3.

Fig. 1.

WITNESS.

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UNITED STATES PATENT OFFICE.

ROBERT D. PIKE, OF SAN FRANCISCO, CALIFORNIA.

MAGNETIC SEPARATOR.

1,233,804. Specification of Letters Patent. Patented July 17, 1917.

Application filed March 13, 1916. Serial No. 83,765.

To all whom it may concern:

Be it known that I, ROBERT D. PIKE, a citizen of the United States, residing at the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Magnetic Separators, of which the following is a specification.

The present invention relates to a magnetic separator, for separating magnetic from non-magnetic substances, and more particularly to a device of the described class adapted to operate upon more or less finely divided material, such as dust, sweepings, etc.

The object of the invention is to provide a machine, of the type described, of the greatest possible efficiency, and at the same time of simple and cheap construction. To this end a continuous closed magnetic field is maintained, and the material to be separated is passed therethrough, in proximity to both poles of the magnet, in the manner hereinafter fully described.

In order to comprehend the invention, reference should be had to the accompanying drawings, wherein—

Figure 1 is a transverse part-sectional elevation of the separator.

Fig. 2 is a part sectional plan view.

Fig. 3 is a side elevation, reduced in size, showing the exterior arrangement of the feed and discharge conduits.

In the drawings, the reference numeral 1 designates a cylindrical shell, preferably formed of non-magnetic material. An axially disposed shaft 2 is rotatably mounted within said shell 1, and carries a pair of spaced armature disks 3, formed preferably of soft iron. Said armature disks are mounted upon a centrally disposed magnetic sleeve 4, which surrounds a non-magnetic bushing 5 immediately surrounding the shaft 2. The armature disks 3 are spaced upon said sleeve 4 by a non-magnetic spacing disk 6, and non-magnetic end plates 7, clamped together by through bolts 8, are employed to hold the entire rotating structure together. Suitable means are provided for rotating the shaft 2 and the structure mounted thereon, as, for example, a belt pulley 9.

The diameter of the spacer 6 and the end plates 7 is very nearly as great as the interior diameter of the shell 1, so that a bare clearance is left between said shell and the periphery of said spacer and end plates. The armature disks 3 are of less diameter than said spacer and end plates, thus forming a pair of annular circumferential channels 10 in the rotor, and the peripheral surfaces of said armature disks 3 are preferably toothed or serrated, as shown at 11, for a purpose hereinafter set forth.

Beside the shell 1 is mounted a pair of magnets 12, shown in the drawings as electro-magnets, the cores 13 of which are connected at their outer ends by a magnetic bar 14, and are formed with pole shoes 15 at their inner ends, said pole shoes 15 being positioned immediately outside the shell 1 in radial alinement with the armature disks 3 of the rotor. A substantially closed path is thus provided for the magnetic flux, comprising the magnet cores 13, the pole shoes 15, the armature disks 3, the sleeve 4, and the bar 14.

The material to be separated is introduced into the upper portions of the annular grooves or channels 10 through a bifurcated manifold 16, Fig. 3 of the drawings, and, guided by deflector plates 17, Fig. 1, falls upon the serrated peripheral surfaces of the armature disks 3, and is carried around by the rotation of said armature disks, in the direction of the arrow, into the region of the pole shoes 15. Here said material enters the magnetic field, and any iron or other magnetic particles are at once attracted to and held against the armature disks 3, while the non-magnetic particles are carried around as an outer layer overlying the magnetic material. A series of baffle plates 18, formed preferably of non-magnetic material, are fixed to and project inwardly from the shell 1, against which the outer layer of material impinges and by which it is agitated and stirred up, so that complete separation of the magnetic and non-magnetic portions of said material is effected.

When the material passes the lowermost of said baffle plates 18, the non-magnetic portions thereof fall into discharge chutes 19, and are carried off in any convenient manner, not shown in the drawings. The magnetic portions of said material adhere to the armature disks 3 until carried beyond the lower end of the pole shoes 15, and therefore out of the magnetic field. The heavier particles thereupon drop into the discharge chutes 20, and any material which still adheres to the surfaces of said armature disks 3 is removed therefrom by brushes

21, and falls into said discharge chutes 20. The brushes 21 are preferably mounted upon swinging arms 22, as shown in Fig. 1 of the drawings, and held against the armature disks as by adjustable counterweights 23. Deflector plates 24, preferably adjustably mounted as shown, form partitions between the discharge chutes 19 and 20 for non-magnetic and magnetic material respectively, and may be set in the correct position to insure proper division of the separated material.

Owing to the magnetic field being stronger at the surface of the armature disks 3 than at the inner surface of the non-magnetic shell 1, and this difference in field strength being enhanced by the serrated contour of said armature surfaces, the effect is to concentrate the lines of magnetic force at the points of the teeth, and to cause the magnetic particles in the material passed through the separator to adhere to the surfaces of the armature disks 3, and not be drawn away therefrom toward the shell 1.

By providing a substantially closed magnetic circuit, there is obtained the greatest possible field strength between the pole shoes 15 and the armature disks 3, and thereby the highest possible efficiency. Moreover, the magnetic leakage from said circuit is very slight, so that the portions of the armature disks lying outside the direct path of the magnetic flux have little or no attraction for the magnetic particles of the separated material, and the discharge of said magnetic particles is thereby facilitated.

It is not my intention to limit myself to the form and construction of the device herein illustrated and described otherwise than as expressly recited in the claims hereto appended, for the reason that many changes may be made therein without departing from the spirit of the invention. On the contrary, I wish to be understood as claiming the invention as broadly as the art will permit.

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

A magnetic separator comprising a stationary substantially cylindrical non-magnetic shell; a pair of spaced electro-magnets positioned side-by-side outside said shell and having their cores disposed radially with respect thereto; a magnetic bridge joining the outer ends of said cores; circumferentially elongated pole shoes carried by the inner ends of said cores and lying adjacent the side of the shell; an axially disposed shaft rotatably mounted within said shell, a non-magnetic core surrounding said shaft, a magnetic sleeve surrounding said core, and a pair of substantially cylindrical armature disks, having transversely serrated peripheral surfaces, mounted upon said sleeve and positioned in transverse alinement with said pole shoes, whereby said magnet cores and their bridge, said armatures, and said sleeve form a substantially closed magnetic circuit; a non-magnetic spacer disk mounted upon said shaft between said armatures, and non-magnetic guide disks similarly mounted adjacent the outer end faces of said armatures, said spacer and guide disks being of greater diameter than said armatures; means for feeding the material to be separated into said shell; interior baffle plates for agitating said material and directing the same onto the peripheral surfaces of said armatures; means for discharging the separated material; and mechanism for rotating said shaft to cause said armatures to carry said material through the magnetic field.

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

ROBERT D. PIKE.

Witnesses:
N. A. ACKER,
D. B. RICHARDS.