

March 13, 1962

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3,024,910

ROTORS FOR HIGH-INTENSITY MAGNETIC SEPARATORS

Filed Jan. 15, 1960

FIG. 1

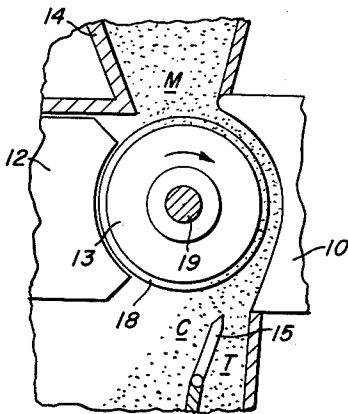


FIG. 2

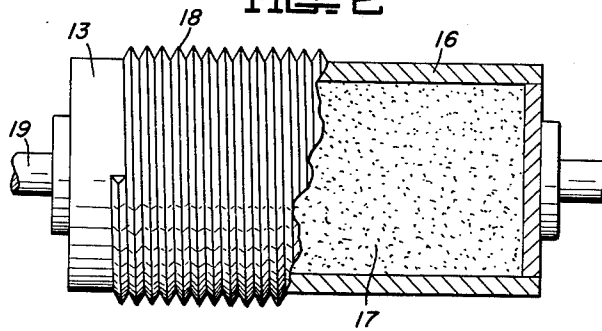
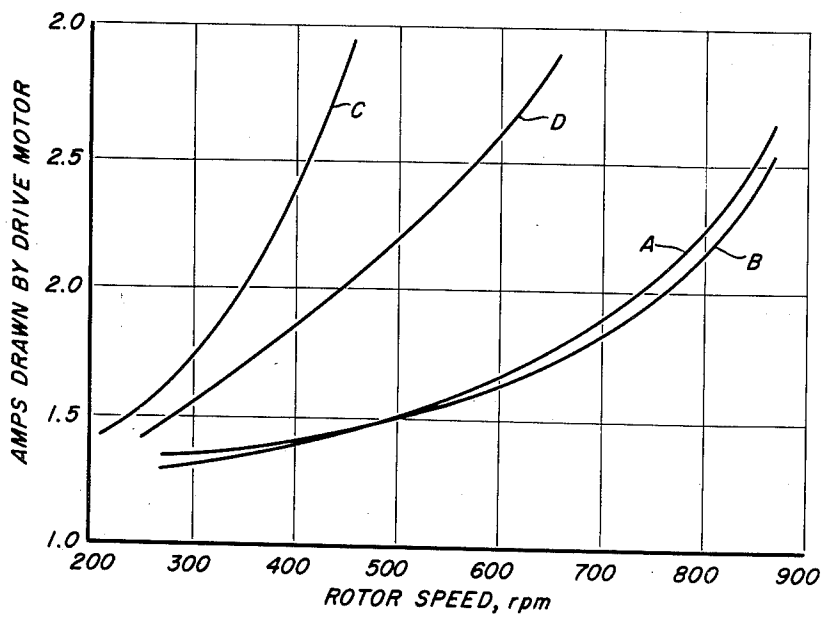


FIG. 3



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ROTORS FOR HIGH-INTENSITY MAGNETIC SEPARATORS

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Filed Jan. 15, 1960, Ser. No. 2,686

4 Claims. (Cl. 209-219)

This invention relates to an improved rotor for a high intensity magnetic separator.

Conventionally a high intensity magnetic separator of the induced rotor type includes primary and secondary pole pieces and a cylindrical rotor of magnetic material journaled therebetween for rotation on a horizontal axis. The rotor surface usually has alternating circumferential grooves and ridges, preferably forming a helix or screw thread. The rotor is driven continuously at a speed of about 200 to 700 r.p.m. and it acquires induced magnetism from the pole pieces. Such separators are used for separating a concentrate of feebly magnetic particles (for example hematite) from a tailing of non-magnetic particles. Dry ore is fed from above into the gap between the primary pole piece and the rotor. Feebly magnetic particles cling sufficiently to the rotor surface that they fall into a separate receiver from nonmagnetic particles, which are thrown from the rotor by centrifugal force. One difficulty encountered with previous separators of this type is that the magnetic field generates eddy currents in the rotor. These eddy currents oppose rotation of the rotor and thus increase the power requirements, and also undesirably heat the rotor. The greater the rotor speed, the greater the effects of eddy currents.

An object of the present invention is to provide an improved rotor construction which reduces eddy currents compared with those generated in a conventional solid steel rotor.

A further object is to provide an improved rotor which decreases the power requirements for operating a high intensity magnetic separator.

A more specific object is to provide an improved rotor formed of a hollow steel cylinder filled with iron powder and whose surface carries ridges of magnetic material, for example a machined thread or helix formed of tightly wrapped wire of triangular cross section.

In accomplishing these and other objects of the invention, we have provided improved details of structure, preferred forms of which are shown in the accompanying drawings, in which:

FIGURE 1 is a vertical sectional view of a portion of a high intensity magnetic separator equipped with a rotor constructed in accordance with our invention;

FIGURE 2 is a side elevational view, partly in section, of our rotor; and

FIGURE 3 is a graph which compares the current requirements of our rotor with conventional rotors.

FIGURE 1 shows a portion of a high intensity magnetic separator which includes spaced apart primary and secondary pole pieces 10 and 12, a rotor 13 journaled in the space therebetween for rotation on a horizontal axis, a feed hopper 14 supported above the rotor, and an adjustable splitter 15 supported beneath the rotor. The magnetic circuit between the pole pieces can be completed through any conventional yoke (not shown) which carries suitable windings for producing a magnetic field of proper intensity. Dry ore fines M are introduced to the hopper 14 and flow therefrom into the gap between the primary pole piece 10 and rotor 13, which is driven in a clockwise direction by any suitable drive motor, not shown. The magnetic field induced in the rotor carries feebly magnetic particles C beyond the split-

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ter 15, where they drop into any suitable receiver. Non-magnetic particles T are thrown off the rotor by centrifugal force before they reach the splitter and drop into a separate receiver.

As FIGURE 2 shows, the rotor of the present invention is formed of a hollow steel cylinder 16 filled with iron powder 17. The outer surface of the cylinder carries circumferential ridges 18, preferably in the form of a helix or screw thread. The ridges can be integral threads machined in the cylinder surface, or else they can be formed of a continuous wire of triangular cross section closely wrapped around the cylinder surface and secured thereon. Preferably the spaces between ridges are left open. Stub shafts 19 are fixed to opposite ends of the cylinder for journalling it in suitable bearings (not shown) and transmitting a driving torque thereto.

Eddy currents generated in our rotor as it rotates in a magnetic field are significantly smaller than those generated in a solid steel rotor under similar conditions. FIGURE 3 shows curves which compare the current requirements of the drive motor of a magnetic separator in which our rotor is used with those of a similar separator in which a conventional solid steel rotor is used. Curve A shows the amperes which the drive motor draws at different rotor speeds with a rotor constructed in accordance with our invention and having a machined thread. Curve B shows this relation with our rotor having a helix formed of triangular wire. Curve C shows this relation with a solid steel rotor having a machined thread, and curve D with a solid steel rotor having a helix formed of triangular wire. It is seen that the power required to operate the motor of a separator which embodies our rotor is much less. In operating magnetic separators of this type, it is usually necessary to perform several separations in series before achieving a satisfactory final separation regardless of the type of rotor. With our rotor, a satisfactory final separation can be achieved with repeated separations as with conventional rotors.

While we have shown and described certain preferred embodiments of the invention, it is apparent that other modifications may arise. Therefore, we do not wish to be limited to the disclosure set forth but only by the scope of the appended claims.

We claim:

1. In an induced rotor high intensity magnetic separator which includes spaced apart primary and secondary pole pieces, a feed hopper above the space between said pole pieces, a splitter below the space between said pole pieces, and respective receivers on opposite sides of said splitter for receiving feebly magnetic particles and nonmagnetic particles, the combination therewith of a rotor journaled for rotation on a horizontal axis in the space between said pole pieces and comprising a hollow steel cylinder, iron powder filling said cylinder, and a plurality of ridges of magnetic material extending around the circumference of said cylinder.

2. A combination as defined in claim 1 in which said ridges form a helix.

3. A combination as defined in claim 2 in which said ridges are formed of an integral thread machined in the cylinder surface.

4. A combination as defined in claim 2 in which said ridges are formed of a wire of triangular cross section closely wrapped around said cylinder and secured thereto.

References Cited in the file of this patent

UNITED STATES PATENTS

832,822	Wait et al. -----	Oct. 9, 1906
2,862,619	Stearns et al. -----	Dec. 2, 1958