

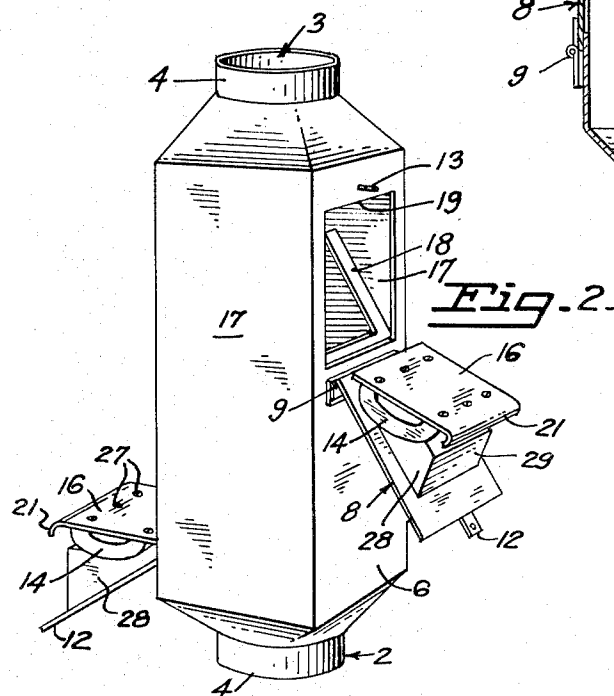
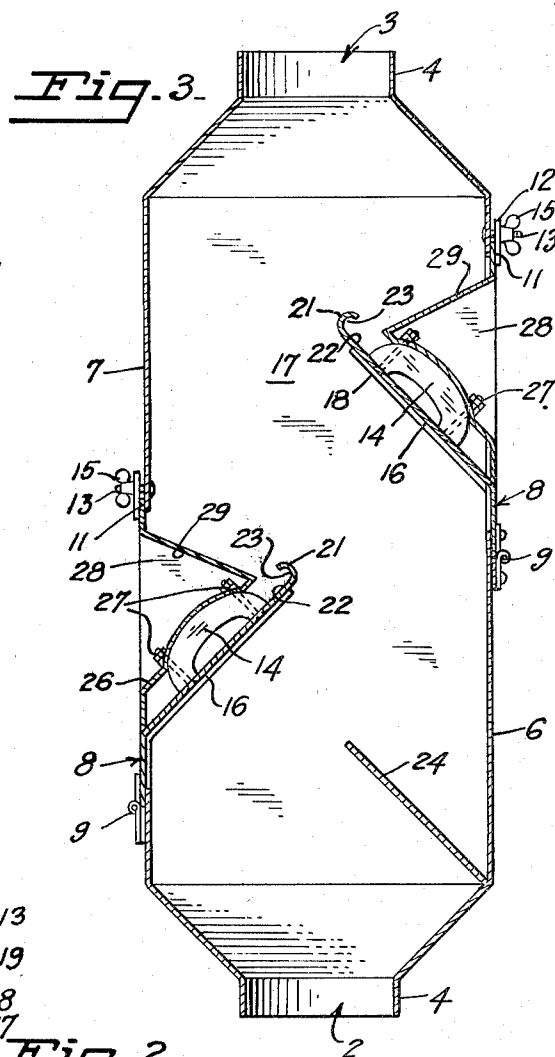
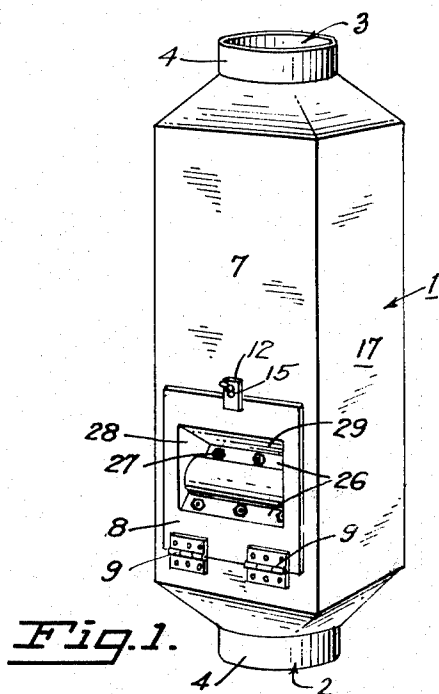
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D. E. STEM

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MAGNETIC SEPARATOR

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INVENTOR.
DONALD E. STEM
BY *George B. White*
ATTORNEY

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MAGNETIC SEPARATOR

Donald E. Stem, San Francisco, Calif.

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4 Claims. (Cl. 209—223)

This invention relates to magnetic separators and particularly to ducts with magnetic separators.

Many attempts have been made in the past to remove metallic or magnetic particles from material flowing through ducts, and particularly in operations involved in handling light material or feed. Hay, rags, or other light material is fed at a comparatively high rate of speed through a duct. Magnets along the walls of the duct used in the past were ineffective because the force of flow created wiping action which works the trapped magnetic particles along the magnet and back into the flow in the duct. Provision of trap doors near magnets for periodic cleaning, required interruption of operations too frequently for long periods and did not eliminate the defects. Due to the speed of flow in such ducts a large proportion of magnetic particles pass by such magnets, and reenter into the material. The previous rise of magnetic baffles at right angles to the sides of the duct unduly retarded the operations and tended to clog the duct at the pockets beside such baffles.

The primary object of my invention is to obviate the aforesaid and other disadvantages of previous magnetic ducts, and to provide a duct wherein magnetic particles are separated from the material flown through a duct with minimum obstruction to such flow, and wherein the wiping force of the flow on the trapped magnetic materials is utilized to collect the magnetic particles in a position out of the way of such flow.

Another object of my invention is to provide a magnetic separator for a duct which can be securely projected into the duct at an optimum angle to the axis of the duct, and which can be swung open out of said duct for the speedy removal of trapped particles.

I am aware that some changes may be made in the general arrangements and combinations of the several devices and parts, as well as in the details of the construction thereof without departing from the scope of the present invention as set forth in the following specification, and as defined in the following claims; hence I do not limit my invention to the exact arrangements and combinations of the said device and parts as described in the said specification, nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

With the foregoing and other objects in view, which will be made manifest in the following detailed description, reference is had to the accompanying drawings for the illustrative embodiment of the invention, wherein:

Fig. 1 is a perspective view of my magnetic separator duct.

Fig. 2 is another perspective view of the duct showing the doors open and the magnets swung to the outside of the duct, and

Fig. 3 is a sectional view of my duct and magnet devices.

In the illustrative embodiment of my invention I make use of a duct 1, which has an inlet 2 and an outlet 3. In this form the inlet 2 and the outlet 3 are in axial alignment with the duct 1 and with one another, and have collars or flanges 4 defining passages which are smaller than the passage through the duct 1.

On opposite walls 6 and 7 of the duct 1 are doors 8, spaced from one another longitudinally of said duct 1. Each door 8 has its hinge 9 at its edge nearest to the inlet 2 so that it swings toward said inlet 2 and outwardly from the duct 1 when opened. On the other transverse edge 11 of each door 8 is a latch 12 which is detachably

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held on a stud 13 on the outside of the adjacent duct wall by a wing nut 15 to hold the door 8 normally closed. The doors 8 are preferably made of non-magnetic material.

A magnet, preferably a permanent magnet 14, of a suitable type and strength, is mounted on each door 8, so that its poles are on a plane at an acute angle to the axis of the duct 1 and to the door 8, the apex or point of the angle being near the hinged edge of the door 8.

A collector element, in this form a collector plate 16, is mounted on the magnet 14 and on the door 8 so that the plate 16 protrudes into the duct at said acute angle incline from about the hinged edge of the door 8 toward the direction of flow through the duct 1 toward the outlet 3. The collector plates 16 extend to about the center of the duct 1. On the side walls 17, adjacent the respective doors 8, are fixed supporting flanges 18 extending at said acute angle from about the lower edges of the respective door openings 19 and toward said outlet 3. Each collector plate 16 rests upon the adjacent side flanges 18 so as to relieve the strain from the door 8. The free transverse edge of each collector plate 16 has on it a curved guide 21, which is curved back toward the underside 22 of the plate 16 and forms a trough 23 out of the way of the flow through the duct 1. The collected magnetic particles are swept by the wiping force of the flow in the duct toward and around said curved guide 21 and to said underside 22 and into the trough 23, and thereby are prevented from being swept back into the material passing through said duct 1.

A baffle 24 extends from the side wall 6 oppositely to the first collector plate 16 nearest the inlet 2 and at right angles to the center of said first collector plate 16 and to about the center of the duct 1, to direct initial flow toward said first collector plate 16.

The collector plates 16 and the baffle 24 extend across the entire width of the respective walls 6 and 7, so that the entire mass of material flowing through the duct 1 is brought within the magnetic fields at the collector plates 16.

It is to be noted that in the herein illustration the door 8 is dished inwardly to form an inclined bracket 26 at a desired angle, and the magnet 14 is mounted on the bracket 26 by suitable bolts 27. The space in the dished portion of the door 8 is covered by bracket sides 28 and a top 29, and the bracket 26 covers the outside of the magnet 14.

The magnetic duct herein described can be easily interconnected into any conduit line, such as a conduit carrying hay or feed to a hay or feed milling machine or the like, used in a dairy or in cattle feeding. The hay or feed material forced through such conduit passes through the duct 1 and the magnetic particles therein are deflected by the alternate opposite baffle and collector plates to the respective magnetic plates. The magnetic particles collected on the plate 16 are wiped along and around the curved guides 21 of the collector plates 16 and are collected at the underside 22 of said plates 16, where the particles are shielded by said plates 16 from the force of material flow. Upon opening a door 8 the collector plate 16 and its guide 21 and trough 22 are exposed and rendered accessible for convenient and speedy cleaning off of the collected magnetic particles. The device is easy to install, efficient in operation, can be speedily cleaned, requires no adjustment, and is eminently adapted for use and operation by the average unskilled person.

The acute angle of the collector plate 16 to the axis of the duct or to direction of flow in the duct, is determined according to the speed of flow and the material handled, so that it is always at optimum angle for the collection of magnetic particles. For instance when more or less powdered materials, grain or sugar are handled the optimum angle is 45 degrees as shown; in connection with upward flow handling hay in certain milling machines it is 30 degrees; on the down flow on certain products that flow easily the best angle is 45 degrees. On the average the acute angle may vary according to conditions from 16 to 60 degrees.

I claim:

1. In a device for separating magnetic from non-

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magnetic materials blown under pressure through a duct, said duct having an opening on a side thereof between an inlet and an outlet of said duct, a door hinged on said side to cover said opening and being swingable outwardly into open position, a skeleton frame inside said duct extended from an edge of said opening into and partly across the passage of said duct, said frame being aligned in a plane inclined at an acute angle toward said outlet and being mounted on the duct sides which are adjacent the duct side with said opening, a magnet mounted on the inside of said door, a magnet plate on said magnet extending substantially at the same angle to the plane of said door as the angle between said skeleton frame and the axis of said duct, said magnet and said plate resting on said skeleton frame when said door is closed thereby relieving said door from the weight of said magnet and said plate, and releasable fastening means to hold said door closed on said opening.

2. In a device for separating magnetic from non-magnetic materials blown under pressure through a duct, said duct having an opening on a side thereof between an inlet and an outlet of said duct, a door hinged on said side to cover said opening and being swingable outwardly into open position, a skeleton frame inside said duct extended from an edge of said opening into and partly across the passage of said duct, said frame being aligned in a plane inclined at an acute angle toward said outlet and being mounted on the duct sides which are adjacent the duct side with said opening, a magnet mounted on the inside of said door, a magnet plate on said magnet extending substantially at the same angle to the plane of said door as the angle between said skeleton frame and the axis of said duct, said magnet and said plate resting on said skeleton frame when said door is closed thereby relieving said door from the weight of said magnet and said plate, and releasable fastening means to hold said door closed on said opening, the distance of the inner free edge of said magnet plate from the hinge of the door being such as to permit the swinging of said magnet plate into and out of said duct through said opening.

3. In a device for separating magnetic from non-magnetic materials blown under pressure through a duct, said duct having an opening on a side thereof between an inlet and an outlet of said duct, a door hinged on said side to cover said opening and being swingable outwardly into open position, a skeleton frame inside said duct extended from an edge of said opening into and partly across the passage of said duct, said frame being aligned in a plane inclined at an acute angle toward said outlet and being

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mounted on the duct sides which are adjacent the duct side with said opening, a magnet mounted on the inside of said door, a magnet plate on said magnet extending substantially at the same angle to the plane of said door as the angle between said skeleton frame and the axis of said duct, said magnet and said plate resting on said skeleton frame when said door is closed thereby relieving said door from the weight of said magnet and said plate, and releasable fastening means to hold said door closed on said opening, the inner edge of said magnet plate being nearest to said outlet and being curved backward toward said door to form a collecting trough on the underside of said plate, said door being hinged at the edge farthest from said free plate edge for positioning said trough downwardly when the door is swung open about its hinge.

4. In a device for separating magnetic from non-magnetic materials blown under pressure through a duct, said duct having a plurality of longitudinally spaced openings offset alternately on the opposite sides of said duct, a door hinged on each opening to cover said opening and being swingable outwardly into open position, a skeleton frame inside said duct extended from an edge of each opening into and partly across the passage of said duct, each of said frames being aligned in a plane inclined at an acute angle toward said outlet and being mounted on the respective duct sides which are adjacent to the duct side with the respective opening, a magnet mounted on the inside of each door, a magnet plate on each magnet extending substantially at the same angle to the plane of the adjacent door as the angle between the skeleton frame and the axis of said duct, each magnet and its plate resting on the adjacent skeleton frame when its door is closed, a curved inner edge of each magnet plate being bent back toward the adjacent door, said magnet and magnet plate being adapted to pass through the adjacent opening when the door is opened, and releasable fastening means to hold each door closed on its opening.

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