Feb. 7, 1956 R. C. HOFF 2,733,812

GRATE MAGNET

Filed March 30, 1953

FIG. 1

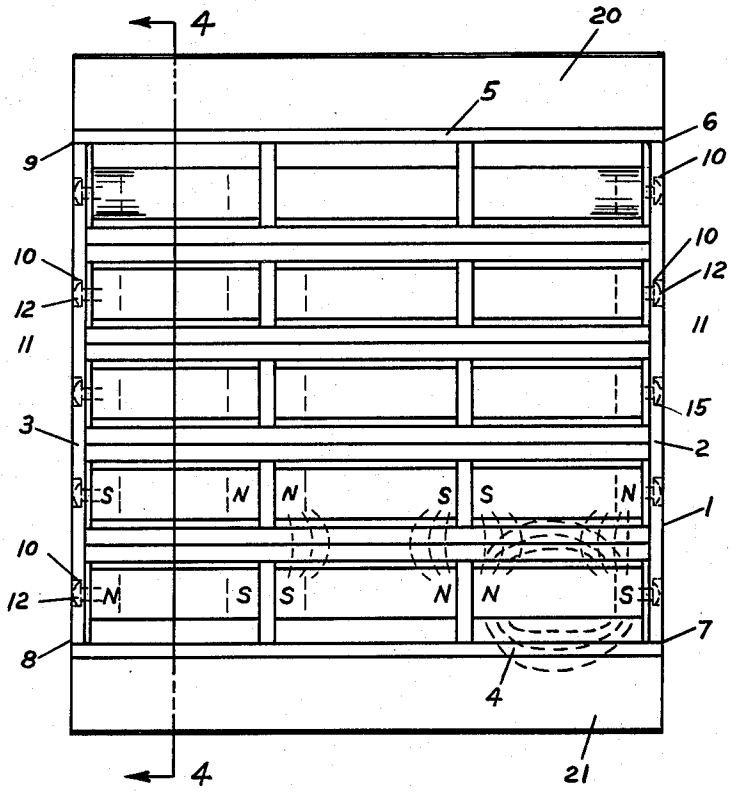
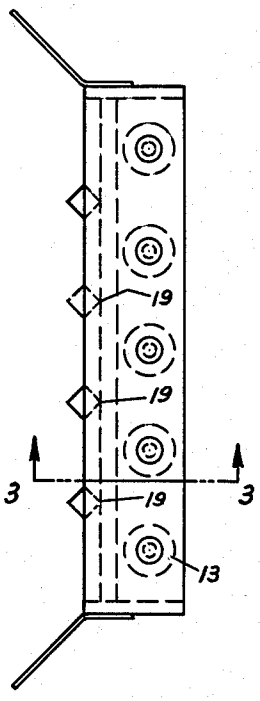


FIG. 2



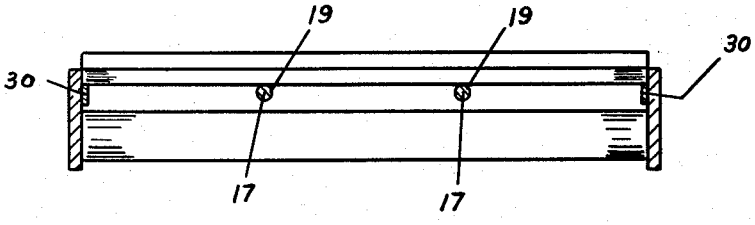


FIG. 3

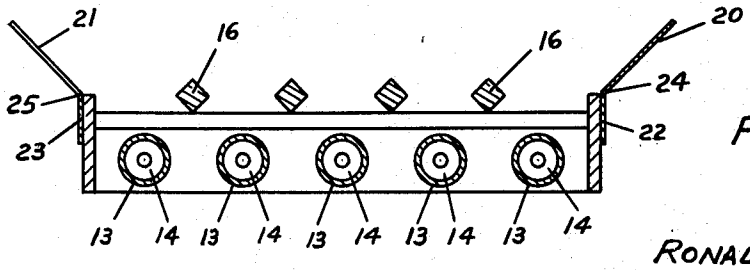


FIG. 4

Inventor

RONALD C. HOFF

By

Charles L. Lorencheck

Attorney

United States Patent Office 2,733,812 Patented Feb. 7, 1956

2,733,812

GRATE MAGNET

Ronald C. Hoff, Erie, Pa., assignor to Eriez Manufacturing Company, Erie, Pa., a corporation of Pennsylvania

Application March 30, 1953, Serial No. 345,526

11 Claims. (Cl. 209—223)

This invention relates generally to magnetic separating devices.

In the manufacture and processing of free flowing material where the material flows through ducts, chutes, and floor openings, it is frequently desirable to remove the tramp iron and ferrous contaminating material therefrom. Magnetic separators made according to present designs and up to the present time adapted for use in these environments with which I am acquainted have been bulky in design and inefficient in operation. No magnetic separators have been made which are entirely satisfactory for use in floor openings, chutes, and similar environments where space limitations prevent the use of more conventional equipment. Prior designs of magnetic separators for such uses have been hard to clean because they have been made up of so many small pieces and the magnetic separators are not structurally suited to withstand severe treatment. Further, the magnetic fields of prior magnetic separators of this type are disposed so as to cause long pieces of tramp iron to come to rest transversely of the pole pieces, thereby obstructing the further flow of material.

It is, accordingly, an object of my invention to overcome the above and similar defects in magnetic separating devices by providing a magnetic separator which is particularly adapted for use in floor openings, chutes, and similar environments.

Another object of my invention is to provide a magnetic separating device which is easy to clean and to remove the particles of iron that adhere thereto.

Another object of my invention is to provide a magnetic separating device which will be efficient in use in a hopper or floor opening.

Another object of the invention is to provide a design of magnetic separator which will lend itself to complete construction of corrosion resistant materials.

Another object of the invention is to provide a magnetic separator wherein the magnetic fields will be parallel to the magnetic elements between the magnetic poles and adjacent the magnetic poles and will extend radially to the magnetic elements whereby magnetic particles are adapted to be held between said magnetic elements.

Another object of my invention is to provide a magnetic separating device which will be simple in construction, economical to manufacture, and efficient in operation.

With the above and other objects in view, the present invention consists of the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawing, and more particularly pointed out in the appended claims, it being understood that changes may be made in the form, size, proportions, and minor details of construction without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawing:

Fig. 1 is a top view of the device according to my invention;

Fig. 2 is an end view of my magnetic separating device;

Fig. 3 is a cross sectional view taken on line 3—3 of Fig. 2; and

Fig. 4 is an end view of my magnetic separating device according to my invention.

Now with more particular reference to the drawing, in Fig. 1, I show a magnetic separating device 1 and end frame member 2 and 3 joined to side members 4 and 5 at 6, 7, 8, and 9 by welding or other fastening means. The frame members 2, 3, 4, and 5 are usually made of hot rolled steel bars and the bars are preferably welded together at corners 6, 7, 8, and 9. Holes 10 are bored in the frame members and these holes 10 are counterbored at 11 to accommodate screws 12.

Attached to the end bars 2 and 3 are the stainless steel tubes 13 which contain the magnets 14. The stainless steel tubes are permanently mounted on the steel frame and held thereto by means of the drive screws 12 which have the heads 15 which are disposed in the counterbores 11. The magnets contained in the stainless steel tubes 13 are of a high strength magnetic material. The magnets are made of magnetic material having high coercive properties such as, for example, the aluminum cobalt alloy material presently on the market under the trademark "Alnico V."

A grid or grate made of the longitudinally extending rods 16 which are square in cross section and the transversely extending rods 17 which are round in cross section is removably associated with the magnetic separator and rests on the cleats 30 slightly above the tubes 13. Rods 16 and 17 are preferably made of hot rolled steel and are welded together at the points of intersection 19. The bars or rods 16 are equally spaced from the nearest adjacent tubes 13. This causes the material to be directed into contact with tubes 13 where it is spread and efficient separation results.

It will be noted that the polarity of magnets in adjacent tubes is alternated as shown in Fig. 1. By putting dissimilar poles adjacent each other, a different effect desirable in some applications is obtained.

The steel grid is provided for the purpose of protecting the magnets and also serves as a baffle to direct the flow of the material to the magnetic tubes to facilitate the removal of the tramp iron and foreign ferrous material from the freely flowing material. The arrangement of the grate also reduces the velocity of free falling material and thereby facilitates the separation of the material.

The wings 20 and 21 are attached to the frames 4 and 5 at 22 and 23, respectively. The rods are preferably attached to the frame member by welding or brazing at 24 and 25 to the side members. The angle of the wings can be adjusted to suit the size of the particular opening or duct in which the magnetic separator is to be used by bending the wings along the edge at 24.

It will be apparent to those skilled in the art in which I am working that I have provided a grate magnet which is adapted to be used in almost any free flowing material wherein the particles thereof are of a relatively small size. The magnetic separator is particularly designed for use in a horizontal position with the grate resting on top. The separator can be placed in hoppers, vertical chutes, floor openings, and similar environments. The grate magnet should be so located that it can be easily removed for frequent cleaning since if an excessive amount of tramp iron is allowed to accumulate on the magnet, the efficiency thereof will be impaired and this condition will continue to exist until the tramp iron has been removed. The grate magnet is preferably cleaned by lifting the entire magnet from its location, removing the steel grid from the framework, and wiping the tramp iron from the tubes with a rag or similar instrument, or by blowing the iron particles from the tubes with an air hose. The grid can then be replaced in its original position on the steel frame

and the entire magnetic separator can be replaced in its operative position in the duct.

In the foregoing specification, I have set forth the invention in its preferred practical forms but I am aware that the structure shown is capable of modification within a range of equivalents without departing from the invention which is to be understood is broadly novel as is commensurate with the appended claims.

What I claim is:

1. A magnetic separator comprising a frame comprising two end members, spaced tubes made of non-magnetic material extending between said ends, and permanent magnets disposed in said tubes, said magnets being disposed with like poles adjacent each other in each said tube, the poles of each magnet being unlike the nearest adjacent poles of magnets adjacent said tubes.

2. A magnetic separator comprising a frame made of magnetic material and comprising two end members, spaced tubes made of non-magnetic material extending between said ends, permanent magnets disposed in said tubes, wing members attached to the side of said frame, said magnets being disposed with like poles adjacent each other in each said tubes, and poles in each said tubes being disposed adjacent unlike poles of magnets in the nearest adjacent of said tubes.

3. A magnetic separator comprising a plurality of spaced non-magnetic tubes, longitudinally spaced magnets disposed in said tubes with like poles adjacent each other, magnets in each tube being disposed with polarity reversed from the corresponding magnet in the adjacent tube, a rectangular frame, said tubes having their ends attached to said frame, cleats on said frame, and a grid made of two sets of parallel bars, each said set of bars arranged at right angles to the other and welded at their points of intersection, said grid resting on said cleats and outwardly and upwardly extending cleats welded to said frame, one of said set of bars having two flat sides opposite said magnets diverging outwardly and in the direction of said magnets and the other of said set of bars being round in cross section, said flat sided bars adapted to deflect material flowing thereagainst toward said tubes whereby magnetic material contained in said material is attracted to said magnets.

4. A magnetic separator comprising a frame comprising two end members, spaced tubes made of non-magnetic material extending between said ends, and permanent magnets disposed in said tubes, said magnets being disposed with like poles adjacent each other in each said tube, the poles of each magnet being unlike the nearest adjacent poles of magnets in adjacent tubes, said tubes being round in cross section.

5. A magnetic separator comprising a plurality of axially aligned magnets disposed in spaced rows, and means to support said magnets in said spaced rows, said magnets in said rows being disposed with like poles adjacent each other, the poles of said magnets in each row being adjacent unlike poles of corresponding magnets in adjacent rows whereby the fields produced by said magnets between said aligned rows of magnets are distorted.

6. The magnetic separator recited in claim 5 wherein said means for supporting said magnets comprises a frame having the ends of said magnets at the ends of said rows supported thereon.

7. The magnetic separator recited in claim 5 wherein a grating is disposed over said magnetic members, said grating comprising elongated members, said elongated members being parallel with said rows of magnets.

8. The magnetic separator recited in claim 7 wherein said elongated members are rectangular in cross section and the diagonal of said rectangle is disposed generally perpendicular to a line drawn through centers of adjacent rows of said magnets.

9. The magnetic separator recited in claim 8 wherein said grating is made of magnetic material.

10. The magnetic separator recited in claim 5 wherein a grating is disposed over said magnetic members, said grating comprising elongated members generally non-circular in cross section, said elongated members being parallel with said rows of magnets.

11. A magnetic separator comprising a frame having two end members, spaced tubes made of non-magnetic material disposed in proximate relation and extending between said ends, permanent magnets disposed in said tubes, said magnets being disposed with like poles adjacent each other, said magnets having magnetic fields having a portion thereof parallel to said tubes, said parallel portion of said fields in one row being substantially distorted by the field in the adjacent row, the space between said tubes being clear of obstructions wherein non-magnetic material may freely fall therebetween, and a grate disposed over the top of said magnetic separator.

References Cited in the file of this patent

UNITED STATES PATENTS

739,228	Schutz	Sept. 15, 1903
2,330,995	Rietz	Oct. 5, 1943
2,648,434	Russell	Aug. 11, 1953

FOREIGN PATENTS

169,881	Austria	May 15, 1951
685,142	Great Britain	Dec. 31, 1952

OTHER REFERENCES

American Miller & Processor, October 1949, pages 68 and 83.

The Bauer Magnetic Grate noting page 83 for an illustration of the grate. (A copy is in the Scientific Library of the Patent Office.)