Title: REMOVABLE MAGNETIC WEDGE SEPARATOR

Abstract: A ferrous metal object separator (10) is removably attachable to a conveyor which transports a moving stream of non-ferrous material (26) (e.g. wood chips) in which some ferrous metal objects (30) (e.g. screws, nuts, broken machinery parts, spikes, nails, steel filings, steel chips, etc.) may be commingled. The separator, which has a non-ferrous body, has an inclined surface (19) extending upwardly from a leading edge (12) to an abrupt trailing edge (14). A separating magnet (24) embedded adjacent the trailing edge magnetically retains the ferrous metal objects (30) without substantially impeding transport of the non-ferrous material (26) along the conveyor. A fastening magnet (16) embedded in the separator removably magnetically fastens the separator on the conveyor.
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
Technical Field

This invention relates to magnetic removal of ferrous metal objects from non-ferrous material.

Background

Conveyors are used to transport various materials. As one example, a vibratory or “shaker” conveyor may transport non-ferrous material such as wood chips. The non-ferrous material may be commingled with ferrous metal objects (e.g. screws, nuts, broken machinery parts, spikes, nails, steel filings, steel chips, etc.), which if not separated from the non-ferrous material could be ingested into other processing machinery, potentially damaging the machinery. Screens provided in a shaker conveyor may not be adequate to remove such ferrous metal objects. This invention assists in removal of such ferrous metal objects.

Brief Description of Drawings

Figure 1 is an oblique perspective view of a magnetically fastenable magnetic wedge separator in accordance with the invention.

Figure 2 is a top plan view of the Figure 1 apparatus.

Figure 3 is a cross-sectional side elevation view of the Figure 1 apparatus in operation on a shaker conveyor.

Description

Throughout the following description, specific details are set forth in order to provide a more thorough understanding of the invention. However, the invention may be practiced without these particulars. In other instances, well known elements have not been shown or described in detail to avoid unnecessarily obscuring the invention. Accordingly, the specification and drawings are to be regarded in an illustrative, rather than a restrictive, sense.
The invention provides a wedge-shaped separator 10 having a leading edge 12 and a trailing edge 14. One or more fastening magnets 16 are embedded within separator 10 to removably magnetically fasten separator 10 atop the ferrous metal surface 18 of a conveyor such as a shaker conveyor, without the need for structural modification or adaptation of the conveyor to receive or retain separator 10. The body of separator 10 is preferably a non-ferrous material such as polyurethane formed in a wedge shape to provide an inclined surface 19 extending upwardly from leading edge 12 to trailing edge 14. Protective caps 20, 22 can be fitted over leading edge 12 and trailing edge 14 respectively. One or more separating magnets 24 are embedded within separator 10, adjacent trailing edge 14. Trailing edge cap 22 is made of a non-ferrous material to minimize interference with the magnetic field 32 of separating magnets 24.

Conveyor surface 18 transports a moving stream of non-ferrous material 26 (e.g. wood chips) in the direction indicated by arrow 28 (i.e. from right to left as viewed in Figure 3). Non-ferrous material 26 may be commingled with some ferrous metal objects 30 (e.g. screws, nuts, broken machinery parts, spikes, nails, steel filings, steel chips, etc.).

Commingled non-ferrous material 26 and ferrous metal objects 30 are transported along conveyor surface 18, initially encountering separator 10’s leading edge 12 which diverts commingled non-ferrous material 26 and ferrous metal objects 30 from conveyor surface 18 onto separator 10’s inclined surface 19. Separator 10 is formed such that its width dimension “W” (Figure 2) in only slightly smaller than the width of conveyor surface 18, so that substantially all material transported along conveyor surface 18 will be diverted onto separator 10’s inclined surface 19. The shaker conveyor’s vibratory (shaking) action transports the diverted commingled non-ferrous material 26 and ferrous metal objects 30 across inclined surface 19, toward and over trailing edge 14 which abruptly intersects conveyor surface 18.
Commingled non-ferrous material 26 and ferrous metal objects 30 encounter the magnetic field 32 of separating magnets 24 as the commingled material and objects are transported over trailing edge 14. Depending upon their size, substantially all ferrous metal objects 30 are magnetically attracted toward separating magnets 24 and magnetically retained on separator 10 near trailing edge 14, without substantially impeding transport of non-ferrous material 26 along the conveyor. More particularly, non-ferrous material 26 is unaffected by separating magnets 24, drops off trailing edge 14 onto conveyor surface 18, and is transported along conveyor surface 18 away from separator 10 in the direction of arrow 28 for further processing (not shown). Periodically, at convenient times, any ferrous metal objects 30 magnetically retained on separator 10 can be removed, for example by scraping such objects off separator 10 with a non-metallic scraping tool (not shown).

Instead of using fastening magnets 16 to removably magnetically retain separator 10 atop conveyor surface 18, metal backing plates can be embedded in separator 10 to facilitate welding, bolting, clamping or other attachment of separator 10 to the conveyor. This may however require structural modification or adaptation of the conveyor to receive or retain separator 10. Besides avoiding conveyor modification or adaptation to receive or retain separator 10, fastening magnets 16 allow rapid removal and replacement of separator 10. Specifically, the tip of a pry bar—not shown—can be inserted into one of leading edge recesses 34 (or into another recess—not shown—in trailing edge 14) and force can then be applied to the pry bar to break the magnetic bond between separator 10 and conveyor surface 18. Other techniques known to persons skilled in the art, such as use of a jacking bolt—not shown—can be employed to break the magnetic bond between separator 10 and conveyor surface 18. The capability to rapidly remove separator 10 from the conveyor also simplifies removal of ferrous metal objects 30 magnetically retained on separator 10, after which separator 10 can be
quickly returned to service on the conveyor. Fastening magnets 16 also allow separator 10 to be rapidly removed from one conveyor and placed in service on a different conveyor.

Fastening magnets 16 further allow separator 10 to be rapidly removed from one location on a particular conveyor and replaced in service at a different location on the same conveyor. This enables optimization of separator 10’s capability to remove ferrous metal objects 30 from non-ferrous material 26, which may be affected by factors such as the particular type of non-ferrous material being conveyed; and, the size, volume or consistency of ferrous metal objects 30 typically commingled within non-ferrous material 26.
WHAT IS CLAIMED IS:

1. A ferrous metal object separator (10) removably attachable to a conveyor for transporting a moving stream of commingled non-ferrous material (26) and ferrous metal objects (30), said separator (10) comprising:
   (a) an inclined surface (19) extending upwardly from a leading edge (12) to a trailing edge (14); and,
   (b) a separating magnet (24) for magnetically retaining said ferrous metal objects (30) without substantially impeding transport of said non-ferrous material (26) along said conveyor.

2. A separator as defined in claim 1, wherein said conveyor has a ferrous metal surface (18), said separator further comprising a fastening magnet (16) for removably magnetically fastening said separator on said surface.

3. A separator as defined in claim 1, wherein said separating magnet (24) is embedded in said separator adjacent said trailing edge (14).

4. A separator as defined in claim 2, wherein said separating magnet (24) is embedded in said separator adjacent said trailing edge (14).

5. A separator as defined in claim 2, wherein said fastening magnet (16) is embedded in said separator.

6. A separator as defined in claim 4, wherein said fastening magnet (16) is embedded in said separator.
7. A separator as defined in claim 1, wherein said separator is formed of a non-ferrous material and has a width (W) slightly smaller than the width of said conveyor.

8. A separator as defined in claim 2, wherein said separator is formed of a non-ferrous material and has a width (W) slightly smaller than the width of said conveyor.

9. A separator as defined in claim 4, wherein said separator is formed of a non-ferrous material and has a width (W) slightly smaller than the width of said conveyor.

10. A separator as defined in claim 2, further comprising at least one pry bar recess (34) formed in an outward edge of said separator.

11. A separator as defined in claim 5, further comprising at least one pry bar recess (34) formed in an outward edge of said separator.

12. A separator as defined in claim 2, further comprising at least one pry bar recess (34) formed in a lower outward edge of said separator.

13. A separator as defined in claim 5, further comprising at least one pry bar recess (34) formed in a lower outward edge of said separator.

14. A method of removing ferrous metal objects (30) from a moving stream of non-ferrous material (26) commingled with said ferrous metal objects, said method comprising:

(a) diverting said moving stream across an inclined surface (19) having an abrupt trailing edge (14); and,
(b) applying a magnetic field (32) near said trailing edge (14) to magnetically retain substantially all said ferrous metal objects (30) near said trailing edge (14) without substantially impeding movement of said non-ferrous material (26).

15. A method as defined in claim 14, further comprising removably magnetically fastening said inclined surface (19) in a fixed position relative to said moving stream.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B03C1/08 B03C1/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B03C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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