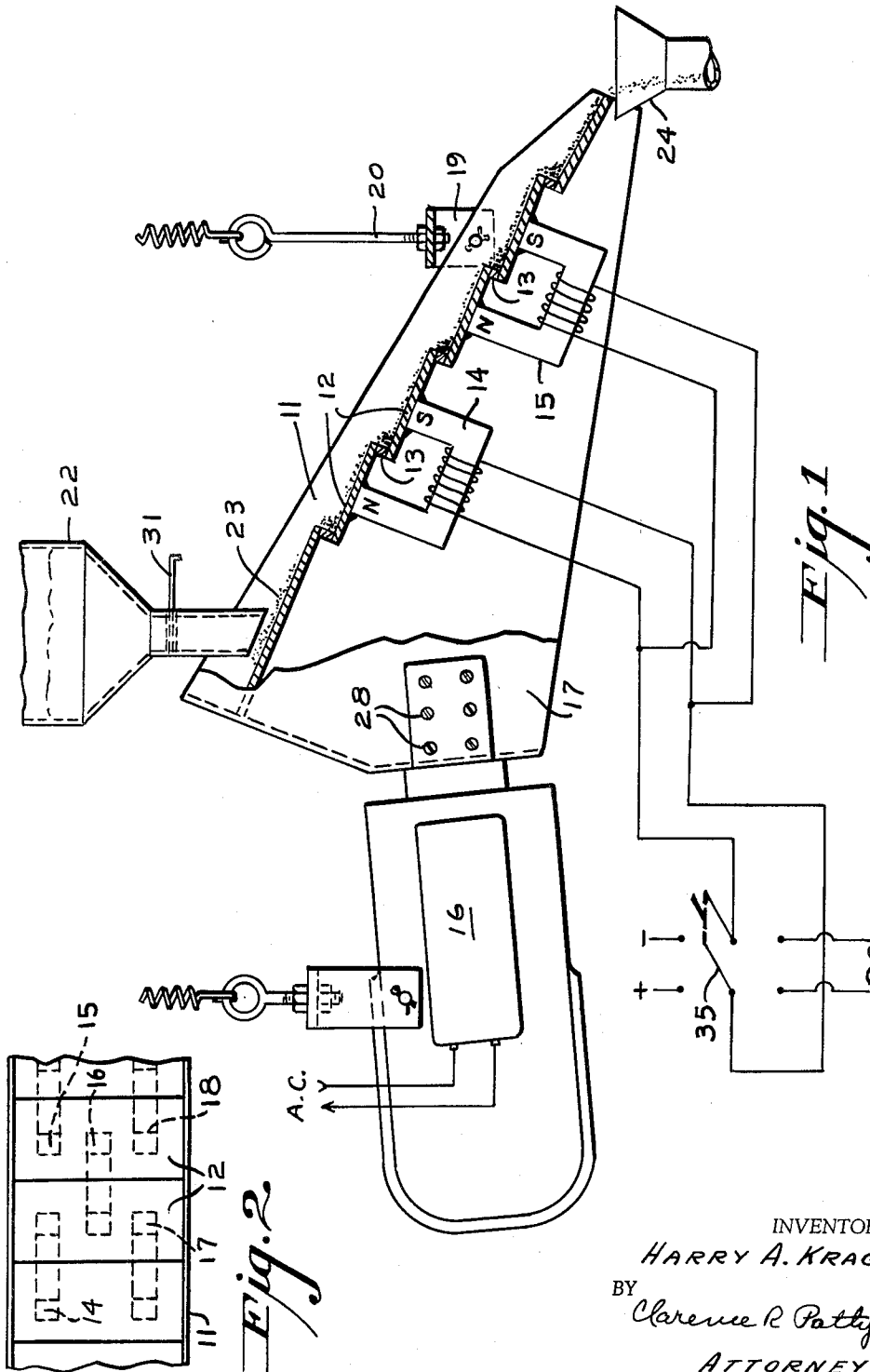


May 8, 1962

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MAGNETIC SEPARATOR
Filed May 19, 1960

3,033,369



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MAGNETIC SEPARATOR

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Filed May 19, 1960, Ser. No. 30,292

1 Claim. (Cl. 209—223)

The present invention relates to apparatus useful in the separation of pulverant magnetic materials or substances from a pulverant mass primarily of nonmagnetic materials or substances.

According to the invention a sloping trough is provided over which pulverant materials are cascaded by appropriate vibration of the trough in a customary fashion. The trough bottom, however, embodies a flight of steps whose treads comprise transverse strips of magnetic material and whose risers comprise transverse strips of nonmagnetic material, with the under sides of adjacent treads bridged by magnets, preferably electromagnets. The magnetic strips or treads thus comprise pole pieces for such magnets and thus the fields of such magnets are concentrated between the front edge of a tread of one step and the rear edge of the tread of the next successive lower step, enabling the efficient accumulation of tramp magnetic material between the treads of the respective steps in the regions adjacent their risers without hindering the flow of nonmagnetic material over the treads of such steps.

For a better understanding of the invention reference is now made to the accompanying drawing which in FIG. 1 shows a preferred form of apparatus embodying the invention in side elevation and partly in section; and in FIG. 2 shows a plan view of a fragment of such apparatus.

Referring to the drawing in detail, 11 represents one side of a trough embodying a bottom comprising primarily a number of transverse strips or step treads such as 12 of magnetic material separated from one another by transverse strips or step risers such as 13 of a nonmagnetic material. Conveniently the strips 13 may comprise nonmagnetic stainless steel directly joined to strips 12 by welding.

Arranged in intimate relation with the under sides of the treads, such as 12, are horseshoe shaped electromagnets such as 14 through 18 respectively, bridging the nonmagnetic strips such as 13 and having their free ends united, as by welding, to the strips, such as 12. Strips 12 thus become the pole pieces for such magnets and create strong magnetic fields in the riser regions between adjacent treads of the respective steps.

A commercial vibrator unit 16 is rigidly secured to a substructural portion 17 of the trough by means of bolts such as 28 so that the trough and vibrator unit embody a rigid assembly. Such assembly is provided with a number of brackets such as 19 to which are secured eye bolts such as 20, by means of which the assembly may be spring suspended for free vibration.

A funnel bottomed container 22 having a material shut off member 31 is arranged to supply pulverant material 23 to the chute, which, at the bottom end is provided with a material receiving container 24.

A switch 35 is provided to alternatively supply direct or alternating current to magnets such as 14 and 15 and the other similar magnets of the separator.

As illustrated, or as will be understood from the instant disclosure, when magnets 14 and 15, together with others

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such as 16, 17 and 18 indicated in FIG. 2, are energized with direct current and the vibrator 21 set into operation, pulverant material 23 issuing from container 22 passes over the strips or treads 12 and any particles of the materials that are magnetic will be trapped for the most part in the magnetic field or gap between the two respective uppermost treads. As this gap fills up, the field becomes ineffective. When this condition is reached the accumulation of magnetic material for the most part occurs in the next field or gap below it.

To remove accumulations of magnetic material from the trough, operation of the vibrator is momentarily discontinued, the material cut off member 31 moved to shut off position, container 24 replaced and the switch 35 moved to the central position (shown) to open the circuits to the magnets, such as 14 through 18. When this is done and the vibrator 21 is again set into operation most of the collected magnetic material will be released and flow down into the container replacing 24. However, a sufficient residual magnetism is retained by the steps to hold some of the fine particles which have previously been captured. To completely rid the steps of this residual magnetism at least momentarily, switch 35 is positioned to apply alternating current to the magnets. Desirably the alternating current is supplied through a rheostat to enable the alternating current flow to be reduced by it to zero at which time the last trace of magnetic material will have been released from the trough.

What is claimed is:

In an apparatus for removing pulverant ferrous material from a mass of pulverant materials, a downwardly sloping chute for intercepting such materials from a supply source thereof and for gravitationally cascading them toward a delivery position, a bottom for said chute comprising alternately arranged strips of magnetic and nonmagnetic material arranged transverse to the chute, electromagnets arranged on the under side of the bottom of said chute, the poles of each being arranged in intimate association with different ones of said strips of magnetic material that are separated from one another by but one of the strips of nonmagnetic material, whereby the respective strips of the magnetic material form pole pieces of the respective electromagnets, means for resiliently supporting said chute, means for agitating said chute to promote ready flow of batch materials over the chute bottom to effect their movement toward a delivery position, means to energize said electromagnets to magnetically retain ferrous constituents of the mass within the magnetic fields of such pole pieces, and means for disabling said electromagnet energizing means and for washing out any residual magnetism that may be retained in said pole pieces following the disabling of said electromagnet energizing means to free magnetically accumulated material from its pole pieces for passage over the chute bottom.

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