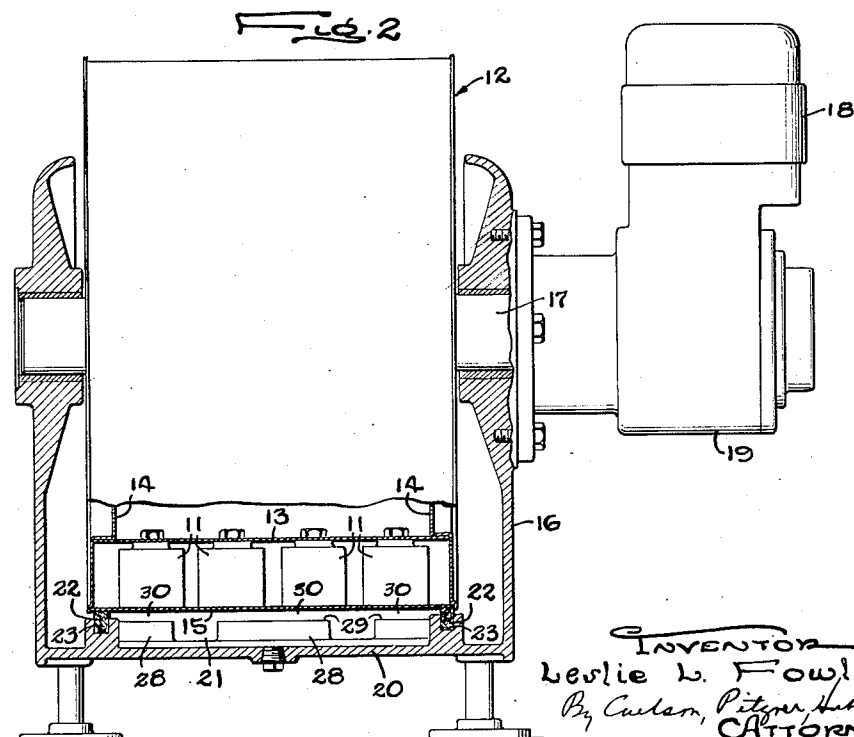
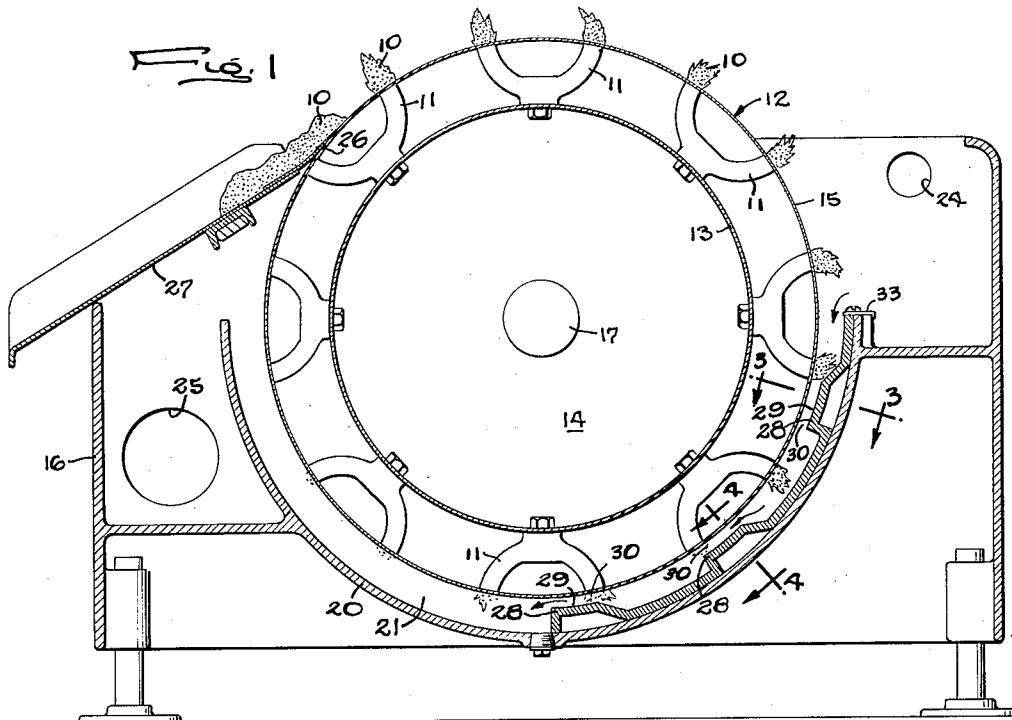


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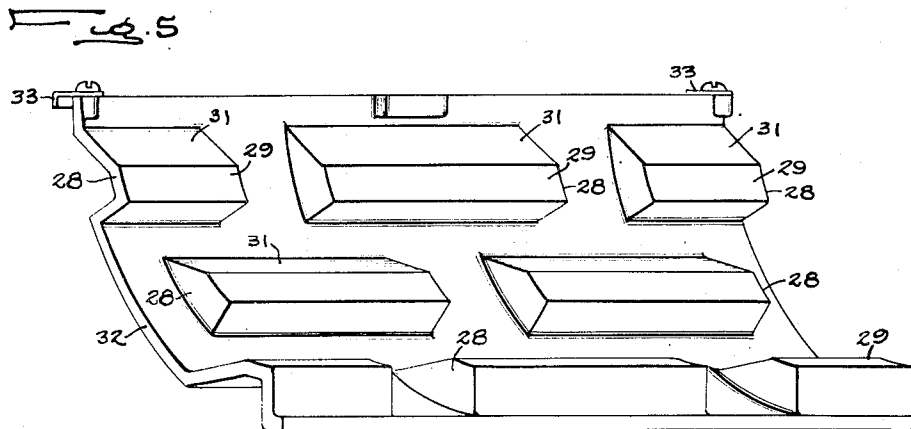
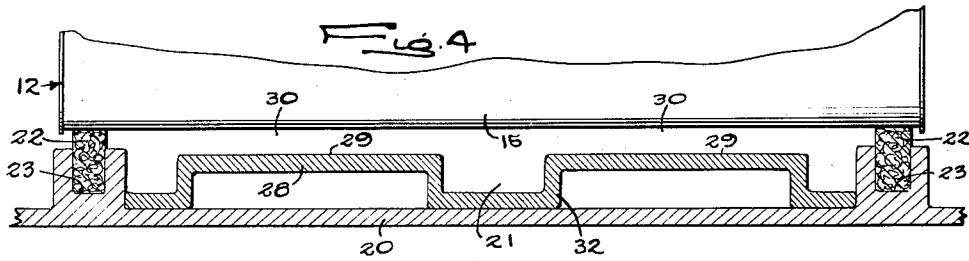
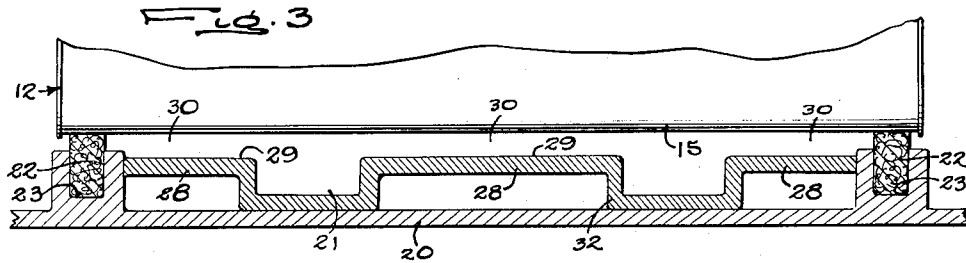
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MAGNET SEPARATOR

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2 Sheets-Sheet 2



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MAGNET SEPARATOR

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2 Claims. (Cl. 210—1.5)

This invention relates to magnetic separators for removing magnetic particles from a liquid such as the coolant used in machining operations. More particularly, the invention has reference to a separator of the type in which the magnets for removing the particles are mounted around the periphery of a drum and the coolant flows through an arcuate passage around a portion of the drum.

The general object is to increase the effectiveness of the separator by directing all of the liquid through the strongest parts of the fields of the magnets while, at the same time, maintaining a comparatively high rate of flow of the liquid.

A more detailed object is to provide a novel arrangement of projections extending into the passage and producing a mixing action which causes substantially all portions of the liquid to flow against the outer wall of the drum and into close proximity to the magnets.

The invention also resides in the novel construction and arrangement of the projections to achieve optimum effectiveness of the separator.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

Figure 1 is a transverse sectional view of a separator embodying the novel features of the present invention.

Fig. 2 is an end view of the separator with parts broken away and shown in section.

Figs. 3 and 4 are fragmentary sectional views taken respectively along the lines 3—3 and 4—4 in Fig. 1.

Fig. 5 is a perspective view of the projections.

As shown in the drawings for purposes of illustration, the invention is embodied in a separator for removing magnetic particles or swarf 10 from a liquid such as the coolant used in machining operations. The particles are removed through the action of permanent magnets 11 arranged in rows which are spaced circumferentially around the periphery and also axially along a horizontal cylindrical drum 12. The U-shaped magnets are bolted to a cylindrical ring 13 supported inside of the drum by a spider 14 with the pole faces of the magnets abutting against the outer wall 15 of the drum. The latter is mounted on a frame or casing 16 and is fast on a horizontal shaft 17 to turn about its longitudinal axis, the shaft being driven in a counterclockwise direction as viewed in Fig. 1 by a motor 18 through a suitable speed reducer 19.

Around the lower half of the drum 12, the casing 16 cooperates with a semicylindrical shell 20 to form a tank whose bottom is concentric with the drum and is spaced radially outwardly from the wall 15 to define a narrow arcuate passage 21 through which the coolant may flow around the periphery of the drum and through the fields of the magnets 11. At the ends of the drum, the passage 21 is sealed by half rings 22 (Figs. 3 and 4) of felt seated in arcuate recesses 23 in the shell 20 and engaging the drum wall 15.

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Coolant delivered to the casing 16 of the separator through an inlet 24 enters the passage 21 on the right as viewed in Fig. 1 and flows down around the drum in the direction opposite to the rotation of the latter as indicated by the arrows. At the other end of the passage, the coolant flows over the edge of the shell 20 to an outlet 25 in the casing. As the drum 12 rotates, magnetic particles 10 in the curtain of coolant flowing through the passage 21 are attracted by the magnets 11 and are held against the wall 15 of the drum. The latter carries the particles up to a scraper 26 which removes the particles from the drum wall and directs them down a chute 27.

To increase the effectiveness of the separator, the present invention contemplates the provision of novel means for mixing the liquid as it flows through the passage 21 to bring each portion of the liquid and the particles 10 carried thereby into close proximity to the surface of the drum 12 where the fields of the magnets 11 are strongest to insure more complete removal of the particles by the magnets. This means comprises a plurality of stationary projections or baffles 28 extending into the passage 21 from the shell 20 toward the drum to intercept the liquid and produce a mixing action or turbulent flow which causes the portions of the curtain of liquid farthest from the drum to flow inwardly toward the drum wall 15. In other words, the various parts of the curtain of liquid shift in and out toward and away from the drum as the liquid flows through the passage 21 so that each portion of liquid is close to the drum at least once as it passes through the separator. The projections 28 intercept different parts of the liquid at different points along the passage thus reducing the tendency of the projections to constrict the passage and permitting a relatively large flow of liquid.

In the present instance, the projections 28 are in the form of elongated lugs projecting radially inwardly from the shell 20 toward the drum 12 along the inlet half of the passage 21. The lugs are arranged in rows extending longitudinally of the drum and circumferentially spaced around the shell, three rows being used in the illustrated embodiment. The lugs in each row are staggered relative to and overlap the lugs in the adjacent row as shown in Fig. 5 to provide a circuitous path for the liquid. Thus, the lugs divert each portion of the liquid inwardly toward the drum at times and laterally of the drum at other times so that, as they wind their way through the passage 21, all parts of the liquid pass through the strongest portions of the magnetic fields at least once. The tops 29 of the lugs are curved slightly to be concentric with the drum wall 15 and are of substantial area to cooperate with the drum in defining narrow channels 30. As it flows through the channels 30, the coolant is brought close to the periphery of the drum and into the fields of the magnets 11. In addition to producing a mixing action, therefore, the lugs by forming these channels also hold the coolant in the strongest parts of the magnetic fields at spaced points around the passage 21. The sides 31 of the lugs facing the inlet of the passage 21 are inclined toward the tops 29 of the lugs in the direction of flow of the coolant to prevent the swarf from collecting at the bottoms of the lugs.

While the lugs 28 may be formed integrally with the shell 20 of the casing 16, it is preferred to cast them separately on an insertible member 32 which thus forms the bottom of the tank. The latter is made of a nonmagnetic material such as aluminum and is curved, having a quarter circle cross section to fit in the passage 21 against the inside of the shell 20. The insert 32 is held in place in the passage by a flange 33 bolted to the upper edge of the insert and hooked over the edge of the shell 20 so that the insert hangs against the shell.

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It will be observed that lugs 28 increase the effectiveness of the separator by mixing and deflecting the coolant to direct each portion of the latter against the drum wall 15 where the fields of the magnets 11 are the strongest. In this way, the metallic particles in the coolant are more readily attracted to the magnets and are removed more completely. At the same time, a comparatively large flow of coolant is obtained since at any point along the passage 21 the lugs act on only a part of the liquid.

I claim as my invention:

1. In a magnetic separator, the combination of, a horizontally disposed drum mounted to rotate about its longitudinal axis, an arcuate shell concentrically mounted about the lower portion of said drum and spaced radially outwardly from the drum periphery to define a narrow arcuate passage between the shell and the drum for the flow of liquid, lugs rigidly mounted on said shell and projecting inwardly toward said drum, said lugs being disposed in circumferentially spaced rows extending longitudinally of said drum with the lugs in one row staggered relative to and overlapping the lugs in the adjacent row, and a plural-

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ity of magnets angularly spaced around the periphery of said drum to attract and remove the magnetic particles in the liquid flowing through said passage.

2. A magnetic separator having, in combination, a rotary cylindrical drum having oppositely polarized peripheral areas spaced axially and circumferentially around its periphery, a tank enclosing the lower portion of said drum and having a bottom cooperating with said periphery to define a passage through which liquid to be cleaned may flow in an arcuate curtain-like stream, and a multiplicity of lugs projecting from said tank bottom toward but short of said drum periphery, said lugs being arranged in circumferentially spaced rows with the lugs of adjacent rows staggered relative to each other.

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