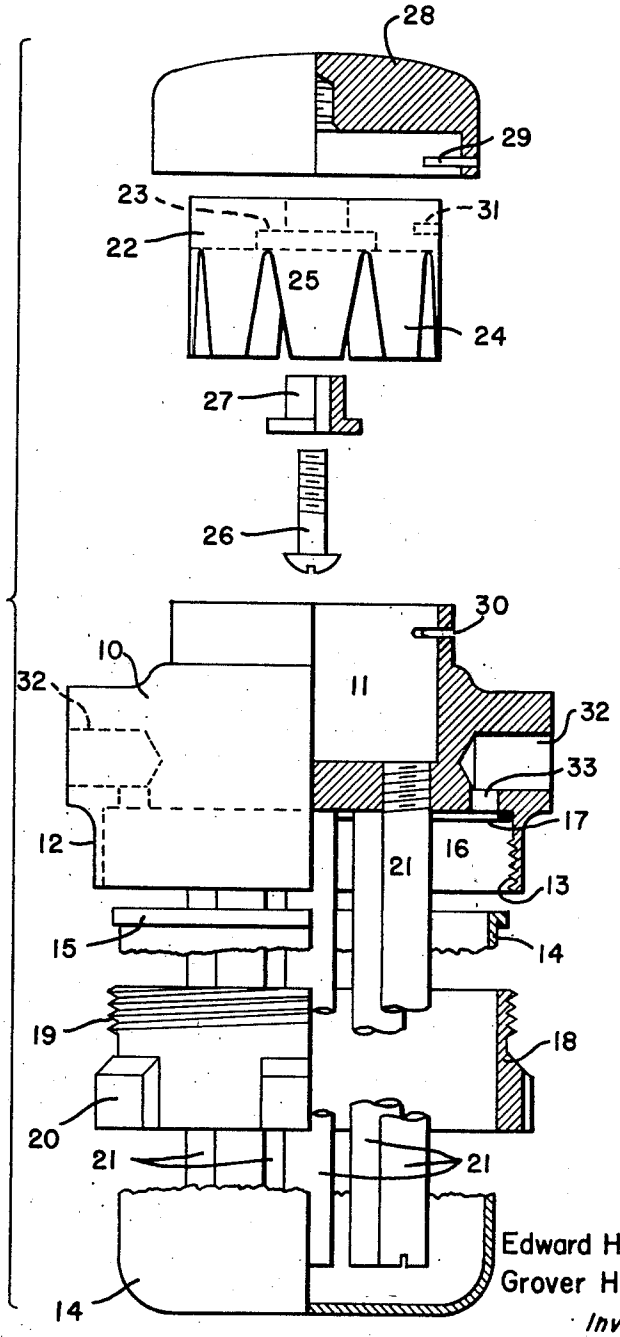
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MAGNETIC FILTER

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Fig. 1



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2 Sheets-Sheet 2

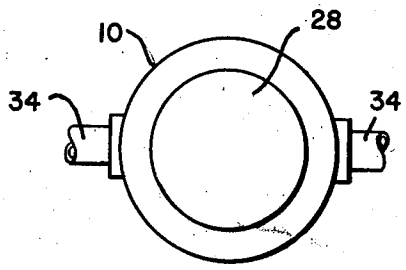


Fig. 2

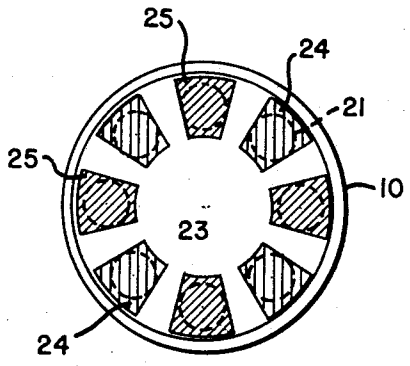


Fig. 4

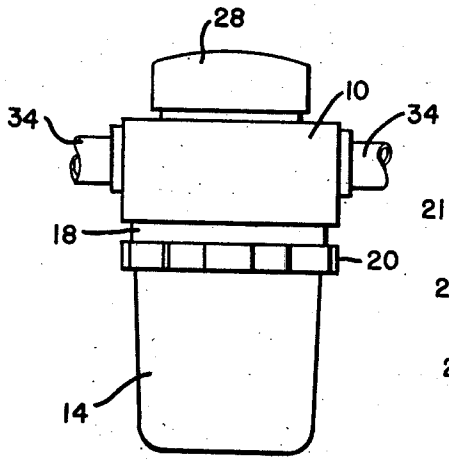


Fig. 3

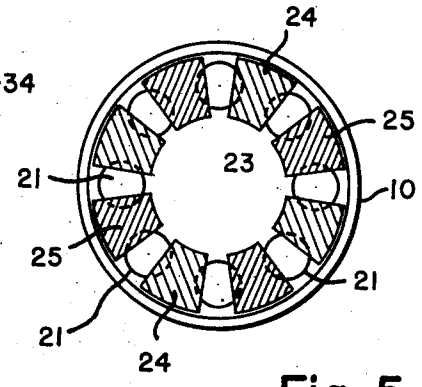


Fig. 5

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MAGNETIC FILTER

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Application September 12, 1955, Serial No. 533,726

3 Claims. (Cl. 210—222)

This invention relates to filters, and in particular to oil filters for use on machine tools, although it may be used for other purposes. Oil or other coolant coming from the cutting tols of automatic screw machines, lathes, drills, milling machines and the like carries with it a quantity of chips which it is necessary to remove before the oil is recirculated. This is ordinarily done by passing the oil through a mechanical filter having a screen or a replaceable cartridge which is cleaned or thrown away after it has become clogged. Where the metal being cut is magnetic, as iron or steel, it has been proposed to employ magnets to which the chips will adhere, but the more efficient such a filter may be the greater will be the adherence between the chips and the magnets, causing great trouble in removing them from the magnets when it is necessary to clean the filter.

It is one object of the present invention to provide a magnetic filter in which the adherence between the magnets and the chips can be terminated at will by short-circuiting the magnetic flux. A further object is to provide means for reversing the polarity of the magnets so that chips of hardened steel which have become permanently magnetized through their contact with the magnets will be repelled rather than attracted. A further object is to provide an oil filter which can be disassembled for cleaning without the use of tools. A further object is to provide an oil filter having no disposable element to cause expense and difficulty in handling. Additional objects will appear from the following description and claims.

Referring to the drawings,

Fig. 1 is an exploded view of a filter constructed in accordance with our invention, partly broken away in median section;

Fig. 2 is a top view on a reduced scale;

Fig. 3 is a side view on the same scale as Fig. 2;

Fig. 4 is a top plan of the filter with the magnet poles indicated by hatching to show their relationship with the soft iron magnets which dip into the oil; the magnet poles being shown in the positions which they occupy during filtering; and

Fig. 5 is a view similar to Fig. 4 showing the magnet poles rotated so that they are short-circuited by the soft iron magnets.

The filter, in accordance with the preferred embodiment, has a body **10** provided with a cylindrical cavity **11** in its upper surface, and a downwardly extending flange **12** interiorly threaded at **13**. A bowl **14**, having a flange **15** at its upper edge, fits within the cavity **16** inside the threaded flange **12**, and bears against a ring packing **17**. The flange **15** is pressed against the packing **17** by a gland **18** threaded at **19** to engage the threads **13**, and having a hand grip **20** by which the bowl can be removed or replaced without the necessity of using tools. The bowl may be provided with threads if desired and the gland omitted.

A plurality of soft iron rods **21** are threaded or otherwise secured to the head **10** with their upper ends flush with the bottom of the cavity **11** and their lower portions extending nearly to the bottom of the bowl **14**. A cylindrical magnet **22**, having a central aperture **23** and its walls cut away to form alternating pole pieces **24** and **25**, is secured by a screw **26** and a spacer **27** to the interior of a cap **28** which fits rotatably over the upper portion of the body **10**. When the cap is in position a pin **29** is driven through it so as to pass through a slot **30** in the upper portion of the body **10** and into a hole **31** in the permanent magnet **22**. The pin is preferably filed off flush with the outer surface of the cap to prevent its unauthorized removal for the purpose of taking away the relatively expensive magnet.

The slot **30** permits a limited rotation of the cap **28** and the permanent magnet **22** relative to the rods **21**, preferably enough to carry each permanent magnet pole from one soft iron rod to the next. The permanent magnet poles **24** and **25** are alternately north and south, so that this amount of rotation will reverse the polarity of the soft iron temporary magnet rods. If a hard steel chip has adhered to one of the rods it will itself become permanently magnetized, and by reversing the polarity of the temporary magnet rod it will be repelled rather than attracted and left free to drop off. If the permanent magnet poles are rotated to the intermediate position of Fig. 5 they will be short-circuited through the soft iron tops of the rods and the latter will be left unmagnetized. Temporarily magnetic chips such as those of soft steel, will thus fall off into the bowl **14** and can be removed. Any chips still adhering to the rods can be readily wiped off with the magnet **22** in the "off" position of Fig. 5.

The body **10** is provided with passages **32**, one at each side, connecting by short bores **33** with the cavity **16**, so that as shown in Figs. 2 and 3 the filter can be connected in the oil line **34**.

What we claim is:

1. A magnetic filter comprising a vessel through which the liquid to be purified passes, a plurality of soft iron rods extending into the interior of the vessel in a circular series, and a cylindrical permanent magnet having spaced poles equal in number to the number of rods and extending parallel to the axis of the cylinder into contact with one end of the series of rods, and means for mounting the permanent magnet for rotation from a position in which each pole contacts the end of one rod to a position in which each pole makes contact with two adjacent rods.

2. A magnetic filter having a body portion provided with entrance and exit ports for the liquid to be purified, a vessel detachably secured to the body portion and bridging the ports so that the liquid may flow through said vessel, a circular series of soft iron rods passing through the body portion and extending at one end into the vessel, a cylindrical permanent magnet having spaced poles equal in number to the number of rods and extending parallel to the axis of the cylinder into contact with that end of the series of rods remote from the vessel, and means for mounting the magnet for rotation about the axis of the circular series of rods an amount equal to one-half the angular distance between adjacent rods, whereby the magnet may be located with each pole in contact with one of the rods or in a position in which each pole bridges across a pair of adjacent rods.

3. A magnetic filter having a body portion provided with entrance and exit ports for the liquid to be purified, a vessel detachably secured to the body portion and bridging the ports so that the liquid may flow through said vessel, a circular series of soft iron rods passing through the body portion and extending at one end into the vessel, a cylindrical permanent magnet having spaced poles equal in number to the number of rods and extending parallel

to the axis of the cylinder into contact with that end of the series of rods remote from the vessel, and means for mounting the magnet for rotation about the axis of the circular series of rods an amount equal to the angular distance between adjacent rods, whereby the magnet may be located with each pole in contact with either of two adjacent rods or in an intermediate position in which each pole bridges across a pair of adjacent rods.

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