March 10, 1959 D. C. VAREKAMP 2,876,902

MAGNETIC FILTER

Filed Dec. 9, 1954

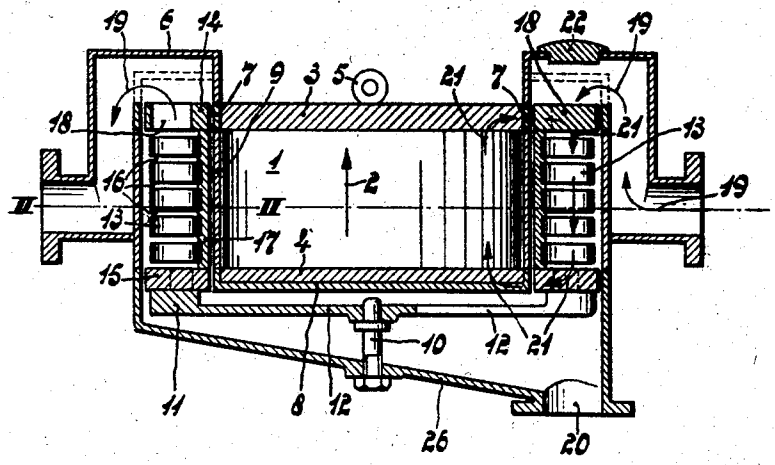

Fig. 1

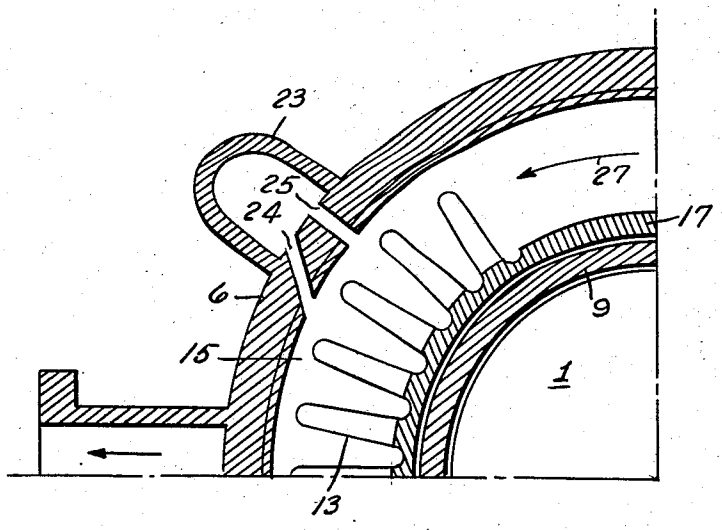

Fig. 2

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United States Patent Office 2,876,902 Patented Mar. 10, 1959

2,876,902

MAGNETIC FILTER

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Application December 9, 1954, Serial No. 474,177

Claims priority, application Netherlands December 31, 1953

4 Claims. (Cl. 210—223)

The present invention relates to a magnetic filter device. More particularly, the invention relates to a magnetic filter comprising a preferably bipolar permanent magnet, which may be detachable and a number of pole pieces made from a material of high permeability between which the magnetic field for capturing ferromagnetic particles to be filtered is produced. The invention has the feature that the pole pieces are secured to a rotary member within a housing, through which the medium or fluid to be cleaned flows. The permanent magnet is provided outside the housing and insulated from the medium to be cleaned and the wall of the housing is furnished with one or more holes through which a cleaning medium is supplied in order to remove the captured particles through an outlet adapted to be closed. The magnet is arranged to be moved sufficiently away from the pole pieces to easily release the captured particles. The poles of the magnet may be adequately short-circuited by means of a member made from a material of high permeability.

The magnetic filter of the present invention has many advantages. First, the construction may be such that by a comparatively slight axial displacement of the permanent magnet, which is accessible from without, the magnetic field between the pole pieces is weakened so that the captured particles are easily blown or washed off and drained by the cleaning medium, for example air or water supplied at a pressure. Second, the magnet is outside the housing through which the medium to be cleaned flows, so that the magnet itself remains clean and dry. The medium to be cleaned may comprise, for example, oil. Third, the rotary member together with the pole pieces may be mounted on a rotary shaft which is passed to the outside through the housing and driven, for example, by means of a lever or handwheel, so that all the pole pieces throughout the periphery of the rotary member are successively exposed to the stream of cleaning medium.

Preferably, the holes for the supply of cleaning medium are provided in such manner that the rotary member together with the pole pieces, also as a result of its shape, are driven by the cleaning medium. Magnetic filters of the type of the present invention are particularly suitable for considerable capacities of from 150 to 200 cubic meters per hour.

In order that the invention may be readily carried into effect it will now be described, by way of example, with reference to the accompanying drawing wherein:

Fig. 1 is a partial elevation and partial sectional view of an embodiment of the magnetic filter device of the present invention; and

Fig. 2 is a view taken along the lines II—II of Fig. 1.

In Fig. 1, the cylindrical permanent magnet **1** is magnetised in an axial direction (arrow **2**). At the poles provision is made of two pole plates **3** and **4**; the plate **3** being provided with a ring **5** by means of which the magnet together with the plates **3**, **4** can be lifted or moved axially. The magnet **1** is situated outside the housing through which the medium to be cleaned, for example

oil, passes. The parts **3**, **4**, **7** and **8** are made from a material of high permeability, while the other parts of the housing and particularly the parts **6** and **9** are made from non-magnetic material. The parts **7**, **8** are contiguous with the pole plates **3**, **4**, respectively, and conduct the magnetic flux within the housing. The parts **6**, **9** of non-magnetic material prevent the magnetic flux from being short-circuited. In the housing, pole pieces **13** (see also Fig. 2) made from undulated strip material, for example soft iron, are mounted on a member **11** which is rotatable about a shaft **10** and which comprises spokes **12**. The pole pieces are arranged concentrically about the magnet **1** between two soft iron pole plates **14**, **15** supplying the flux to the pole pieces **13**. The pole pieces **13** and the pole plates **14**, **15** are positioned with interstices **16** therebetween and secured to a cylindrical member **17** of non-magnetic material. The interstices **16** constitute the air-gaps in which the ferro-magnetic particles from the medium to be cleaned are captured and held. The magnetic flux through the filter is indicated by arrows **21**. The pole plate **14** is furnished with holes **18** through which the medium to be cleaned flows (arrows **19**) between the pole pieces and leaves the filter at its left-hand end. The outlet **20** is closed, for example by means of a closure device which is opened when it is desired to clean the filter.

At the top, the housing is provided with a hole accommodating a plug **22** which permits the rotary member with holes **18**, prior to the operation of the filter, to be correctly positioned relative to the inlet and outlet ducts. The plug **22** may be a valve which is automatically closed by means of a float when the housing is filled.

If the filter is to be cleaned, the inlet and outlet of the filter are closed. The magnet **1** is lifted or axially moved, by means of the ring **5** so that the magnetic circuit is interrupted and the particles collected in the gaps **16** are readily releasable. Subsequently, the cleaning fluid outlet **20** is opened and the filter is emptied. Then a cock for the supply of cleaning medium, or fluid, such as for example, water, in a tube **23** (Fig. 2) is opened. The tube **23** adjoins the housing and is provided with holes **24**, **25**. The holes **24** are provided tangentially, the holes **25** radially. Such holes may be provided throughout the height of the housing. The holes **24** are preferably provided opposite the pole pieces **13** so that the rotary member **11** with pole pieces **13**, in the form of a blade wheel, is driven in the direction of the arrow **27** by the water jets from the said holes striking the pole pieces **13** tangentially. The holes **25** are provided opposite the air gaps **16** so that the latter are rinsed by streams of cleaning fluid from the said holes.

On the periphery of the housing of the filter, there may be provided, for example four tubes **23**.

After emptying the filter by carrying off the cleaning fluid or water together with the captured particles along the inclined bottom **26**, the cleaning fluid or water supply and the outlet **20** are shut off. The magnet **1** may subsequently be placed in an axial direction and the supply of medium to be cleaned may then be resumed to the filter.

What is claimed is:

1. A magnetic filter comprising a housing, a recess, outside said housing formed by said housing, a permanent magnet located in said recess, predetermined parts of said housing being constituted of material of high permeability, a plurality of spaced pole pieces, means mounting said pole pieces in said housing for rotational movement for cleaning purposes only, the ferro-magnetic particles in said filter being captured in the space between said pole pieces by means of magnetic flux furnished by said permanent magnet and conducted through said predetermined parts of said housing and said pole pieces, means for supplying a medium to be cleaned to said pole pieces

comprising main inlet and outlet openings in said housing, and means for removing the captured particles from said housing comprising additional inlet openings in said housing positioned to tangentially apply a cleaning medium to said pole pieces and an additional outlet opening in the bottom of said housing positioned to drain said cleaning medium from the said housing, said pole mounting means being rotatably driven by said cleaning medium striking said pole pieces.

2. A magnetic filter comprising a housing, a recess outside said housing formed by said housing, a permanent magnet located in said recess, said permanent magnet having a pair of pole plates, parts of said housing contiguous with said pole plates being constituted of material of high permeability, other parts of said housing being constituted of non-magnetic material, a plurality of spaced pole pieces, means mounting said pole pieces in said housing for rotational movement for cleaning purposes only, the ferromagnetic particles in said filter being captured in the space between said pole pieces by means of magnetic flux furnished by said permanent magnet and conducted through said predetermined parts of said housing and said pole pieces, means for supplying a medium to be cleaned to said pole pieces comprising main inlet and outlet openings in said housing, and means for removing the captured particles from said housing comprising additional inlet openings in said housing positioned to tangentially apply a cleaning medium to said pole pieces and an additional outlet opening in the bottom of said housing positioned to drain said cleaning medium from the said housing, said pole mounting means being rotatably driven by said cleaning medium striking said pole pieces.

3. A magnetic filter comprising a housing, a recess outside said housing formed by said housing, a permanent magnet located in said recess, predetermined parts of said housing being constituted of material of high permeability, a plurality of spaced pole pieces, means mounting said pole pieces in said housing for rotational movement for cleaning purposes only, the ferro-magnetic particles in said filter being captured in the space between said pole pieces by means of magnetic flux furnished by said permanent magnet and conducted through said predetermined parts of said housing and said pole pieces, means for supplying a medium to be cleaned to said pole pieces comprising main inlet and outlet openings in said housing, means for removing the captured particles from said housing comprising additional inlet openings in said housing positioned to apply a cleaning medium to said pole pieces and an additional outlet opening in the bottom of said housing positioned to drain said cleaning medium from the said housing, a number of said additional inlet openings being positioned to tangentially apply said cleaning medium to said pole pieces and the remainder of the said additional inlet openings being positioned to radially apply said cleaning medium to said pole pieces, said pole mounting means being rotatably driven by the tangentially directed cleaning medium striking said pole pieces.

4. A magnetic filter comprising a housing, a recess outside said housing formed by said housing, a permanent magnet located in said recess, predetermined parts of said housing being constituted of material of high permeability, a plurality of spaced pole pieces comprising a number of undulated metal strips positioned concentrically around said permanent magnet, means mounting said pole pieces in said housing for rotational movement for cleaning purposes only, the ferro-magnetic particles in said filter being captured in the space between said pole pieces by means of magnetic flux furnished by said permanent magnet and conducted through said predetermined parts of said housing and said pole pieces, means for supplying a medium to be cleaned to said pole pieces comprising main inlet and outlet openings in said housing, and means for removing the captured particles from said housing comprising additional inlet openings in said housing positioned to tangentially apply a cleaning meduim to said pole pieces and an additional outlet opening in the bottom of said housing positioned to drain said cleaning medium from the said housing, said pole mounting means being rotatably driven by said cleaning medium striking said pole pieces.

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