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(56) Documents Cited

**GB 2163065 A GB 2056429 A GB 1577930 A
GB 1527753 A GB 1373388 A GB 1163426 A
GB 1140850 A GB 1043616 A GB 0672626 A
EP 0069435 A1 WO 88/09770 A1**

(58) Field of Search

UK CL (Edition L) C1C

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(54) **Filter medium**

(57) The invention relates to a filter comprising a composite medium which can achieve, in sewage water to be treated, both solids removal and disinfection of the water being treated. This effect is particularly applicable in the tertiary treatment of sewage effluent requiring both "polishing" (solids/ammonia removal) and disinfection (bacteria removal) prior to discharge. Alternatively, a composite medium embodying the invention may be used as part of an advanced clean water treatment process where a filter comprising the medium would be situated downstream of a granular activated carbon filter, and/or possibly at the point of use. Such an application reduces the need for a residual chlorination system and operation in a sewage treatment works.

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FILTER MEDIUM

The invention relates to a filter medium, particularly that used in a biologically aerated filter for sewage effluent treatment.

In the past a filter medium for sewage effluent treatment comprised sand, gravel or the like in one or more layers, with or without other layers such as carbon, particularly in activated form. Such a filter medium has to be regenerated as it rapidly becomes clogged with removed particles, which is an expensive procedure, and moreover such a medium cannot generally be used to remove bacteria in any great quantity, for which expensive chlorination or other plant is often required.

It is accordingly an object of the invention to seek to mitigate these disadvantages.

According to a first aspect of the invention there is provided a filter, comprising a composite medium having constituents wherein the composite is adapted to remove at least solids and bacteria from a fluid stream.

According to a second aspect of the invention there is provided a dual role biologically aerated filter for sewage effluent treatment, comprising a filter as hereinbefore defined.

Preferably, the composite medium may comprise a zeolite coated with a synthetic resin comprising (separate) constituents. This provides a relatively rigid and dimensionally stable medium.

The zeolite may be a natural zeolite and the synthetic resin a hydrophilic

synthetic resin for example a low cross-linked poly (4-vinylpyridinium bromide). This provides a relatively simply produced composite filter medium which not only removes solids and ammonia, but also removes bacteria such as E. coli, coliforms, salmonella and faecal streptococci from a liquid such as sewage effluent passing through a filter comprising the composite medium. It is believed that bacteria are removed by being adsorbed into the surface of the composite medium because of the hydrophilic nature of the medium, the solids being trapped in the medium which has a very fine porous structure.

Also, surface electrical charge or energy assists in the entrapment of solids and ammonia ions.

The composite medium preferably comprises a mass of grains, powders or particles each of which comprises a base of natural zeolite and a coating of synthetic hydrophilic resin.

A filter medium described herein embodying the invention thus, in sewage water to be treated, can achieve both solids removal and disinfection of the water being treated. This effect is particularly applicable in the tertiary treatment of sewage effluent requiring both "polishing" (solids/ammonia removal) and disinfection (bacteria removal) prior to discharge. Alternatively, a composite medium embodying the invention may be used as part of an advanced clean water treatment process where a filter comprising the medium would be situated downstream of a granular activated carbon filter, and/or possibly at the point of use. Such an application reduces the need for a residual chlorination system and operation in a sewage treatment works.

A composite medium embodying the invention would be equally applicable in a biologically aerated filter (BAF) or a flooded filter.

CLAIMS

1. A filter, comprising a composite medium having constituents wherein the composite is adapted to remove at least solids and bacteria from a fluid stream.
2. A filter according to Claim 1, the composite medium comprising a zeolite coated with a synthetic resin.
3. A filter according to Claim 2, the resin comprising separate constituents.
4. A filter according to Claim 2 or Claim 3, the zeolite comprising a natural zeolite and the synthetic resin a hydrophilic synthetic resin for example a low cross-linked poly (4-vinylpyridinium bromide).
5. A filter according to Claim 3 or Claim 4, the composite medium comprising a mass of grains, powders or particles each of which comprises a base of natural zeolite and a coating of synthetic hydrophilic resin.
6. A filter substantially as hereinbefore described.
7. A dual role biologically aerated filter for sewage effluent treatment, comprising a filter according to any preceding claim.

**Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)**

Application number
GB 9213932.8

Relevant Technical fields

- (i) UK Cl (Edition L) C1C
- (ii) Int Cl (Edition 5) C02F

Search Examiner

R HONEYWOOD

Databases (see over)

- (i) UK Patent Office
- (ii) ONLINE DATABASE: WPI

Date of Search

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Documents considered relevant following a search in respect of claims 1-7

| Category (see over) | Identity of document and relevant passages | Relevant to claim(s) |
|---------------------|---|----------------------|
| X | GB 2163065 A (PALL CORPORATION) | 1 at least |
| X | GB 2056429 A (TAKEDA CHEMICAL INDUSTRIES) | 1 at least |
| X | GB 1577930 (COMMONWEALTH SCIENTIFIC & INDUSTRIAL RESEARCH ORGANISATION) | 1 at least |
| X | GB 1527753 (MITSUBISHI RAYON CO LTD) | 1 at least |
| X | GB 1373388 (TEIJIN LTD) | 1 at least |
| X | GB 1163426 (KATA MANUFACTURING & FILTERING CO) | 1 at least |
| X | GB 1140850 (FRAM CORPORATION) | 1 at least |
| X | GB 1043616 (DOW CHEMICAL CO) | 1 at least |
| X | GB 672626 (PERMUTIT COMPANY LTD) | 1 at least |



Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

Relevant Technical fields

(i) UK CI (Edition) Contd. from page 3

(ii) Int CI (Edition)

Databases (see over)

(i) UK Patent Office

(ii)

Search Examiner

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6 SEPTEMBER 1993

Documents considered relevant following a search in respect of claims

| Category (see over) | Identity of document and relevant passages | Relevant to claim(s) |
|------------------------|--|-------------------------|
| X | EP 0069435 A1 (MITSUBISHI RAYON CO LTD) | 1 at least |
| X | WO 88/09770 A1 (BUSCH) | 1 at least |

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