MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1944
APPLICATION FOR A PATENT

IMPERIAL CHEMICAL INDUSTRIES LIMITED

of Imperial Chemical House, Millbank, London SW1P 3JF, England

hereby apply for the grant of a Patent for an invention entitled

"IMPROVEMENTS IN AND RELATING TO PREFABRICATED SUBSURFACE DRAINS"

which is described in the accompanying complete specification.

(Note: The following paragraph applies only to Convention applications)

This application is a Convention application based on the basic application for a patent or similar protection identified by number, country, and filing date as follows:

No. 34345/77 filed in Great Britain on 16th August, 1977

Address for Service: PHILLIPS ORMONDE AND FITZPATRICK
Patent and Trade Mark Attorneys
367 Collins Street
Melbourne, Australia 3000


IMPENAL CHEMICAL INDUSTRIES LIMITED
By its attorneys
PHILLIPS ORMONDE AND FITZPATRICK

PHILLIPS ORMONDE AND FITZPATRICK
Patent and Trade Mark Attorneys
367 Collins Street
Melbourne, Australia
In support of the Convention application made by

**IMPERIAL CHEMICAL INDUSTRIES LIMITED**

(hereinafter called "applicants") for a patent for an invention entitled

"IMPROVEMENTS IN AND RELATING TO PREFABRICATED SUBSURFACE DRAINS"

I, **ARNOLD ARTHUR MEES**

Officer duly appointed, of Imperial Chemical Industries Limited,
Imperial Chemical House, Millbank, London, S.W.1., England,

do solemnly and sincerely declare as follows:

1. I am authorised to make this declaration on behalf of the applicants.

2. **ERIC McKENZIE** and **JOHN ARTHUR NIXON** both of 54 Hookstone Road, Harrogate,
North Yorkshire, England

are the actual inventors of the invention and the facts upon which the applicants are entitled to make the application are as follows:

Applicants are the assignees of the said invention from the actual inventors.

3. The basic application(s) for patent or similar protection on which the application is based is/are identified by country, filing date, and basic applicant(s) as follows: Great Britain on 16th August 1977 by **IMPERIAL CHEMICAL INDUSTRIES LIMITED**

4. The basic application(s) referred to in paragraph 3 hereof was/were the first application(s) made in a Convention country in respect of the invention the subject of the application.


Dated 3rd August 1978

To: The Commissioner of Patents
A synthetic filter medium for use in prefabricated subsurface drains comprising a laminated structure formed by a supporting sheet material which exhibits high tensile and flexibility properties having bonded thereto, over at least one surface thereof, a filter sheet material, the filter material being a non-woven fabric, comprising thermoplastic polymeric filaments or fibres bonded to one another and being sufficiently permeable to allow the passage of water therethrough while retaining soil, and the supporting material having a structural configuration whereby channels are formed between it and the filter material such that liquid, e.g. water, is free to flow therethrough.
AUSTRALIA

Patents Act

COMPLETE SPECIFICATION
(ORIGINAL)

APPLICANT'S REF.: ICI Case No. F29747/AU

Name(s) of Applicant(s): IMPERIAL CHEMICAL INDUSTRIES LIMITED

Address(es) or Applicant(s): Imperial Chemical House, Millbank, London SW1P 3JF, England.

Actual Inventor(s): Eric McKeand and John Arthur Nixon

Address for Service is:

PHILLIPS, ORMONDE & FITZPATRICK
Patent and Trade Mark Attorneys
367 Collins Street
Melbourne, Australia, 3000

Complete Specification for the invention entitled:

"IMPROVEMENTS IN AND RELATING TO PREFABRICATED SUBSURFACE DRAINS"

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):
The present invention concerns improvements in and relating to prefabricated subsurface drains.

Subsurface drains have been used for many years to remove excess water from the ground to improve crop growth, strengthen pavement foundations, stabilise slopes, and reduce water pressure against retaining walls. The water is usually carried away from the site by a perforated pipe, and a filter material must be provided between the soil and the pipe that will retain the soil while allowing free flow of water into the pipe.

Long established methods have utilised a filter composed of mineral aggregate graded so as to match the soil, but this type of filter performed satisfactorily only when designed and constructed with great care.

The present invention seeks to provide a synthetic filter medium, comprising a laminated structure for use in prefabricated subsurface drains.

According to the present invention, a synthetic filter medium for use in prefabricated subsurface drains comprises a laminated structure formed by a supporting sheet material which exhibits high tensile and flexibility properties having bonded thereto, over at least one surface thereof, a filter sheet material, the filter material being a non-woven fabric comprising thermoplastic polymeric filaments or fibres bonded to one another and being sufficiently permeable to allow the passage of water therethrough while retaining soil, and the supporting material having a structural configuration whereby channels are formed between it and the filter material such that liquid, e.g., water, is free to flow therealong.

The invention also includes prefabricated subsurface drains which are formed from or incorporate such synthetic filter medium.

The laminated structure may comprise the supporting sheet material with the non-woven filter fabric bonded to one side only. The supporting sheet material may have the non-woven filter fabric bonded to both sides thereof, or the non-woven filter fabric bonded to one side and an impermeable sheet material, for example, a synthetic polymeric film, bonded to the other side; in these cases
the supporting material acts as a core or spacer.

Preferably, the non-woven filter fabric is formed from synthetic, polymeric, thermoplastic, bicomponent filaments or fibres of sheath/core or side/side configuration in which one of the components has a lower melting point than the other components, and in which the filaments are bonded together at their points of contact by means of the lower melting point component following a heat treatment. A preferred non-woven fabric of this type is sold under the Registered Trade Mark 'TERRAM'.

The non-woven filter fabric, although being permeable to water and soil retaining, is desirably constructed to have a mesh size capable of initially allowing finer fractions of soil to pass, thereby creating a natural filter zone in the soil in the immediate proximity to the fabric. Consequently, the filter zone then has a higher permeability than the surrounding soil.

The supporting sheet material or core has a structural configuration such that it can inherently form channels for the flow of water from the filter fabric. Preferably, it has an open, net-like structure formed for example of expanded metal or thermoplastic plastics material. Desirably, a thermoplastic plastics mesh- or net-like material is used, such as sold under the Registered Trade Mark 'MYLON'.

Various techniques may be used to bond together the component materials of the laminated structure. The prime consideration is to achieve an adequate bond strength without impairing the filtering action of the non-woven fabric. Thermal bonding techniques are preferred.

In respect of a laminated structure comprising 'TERRAM' non-woven fabric and 'MYLON' mesh material a particularly preferred technique is flame bonding. In utilising this method, a surface of the mesh material is softened by a flame and is then brought into contact with the non-woven fabric and pressure applied, e.g. by passing the mesh material and the non-woven fabric between a pair of nip rolls. The speed of passing the mesh material relative to the flame, the flame temperature, and the distance of the flame from the surface of
the mesh material determine the conditions under which the appropriate amount of softening occurs. Desirably, heavier grades of 'LEERAM' non-woven fabric, or 'LEERAM' 1000, are used with the flame bonding process. The impermeable sheet material, if present, may also be attached by this method.

The structural configuration of the supporting sheet material is purely to permit water to flow away from the filter fabric. It must also permit the initial flush of fine soil particles to take place. The openness of the supporting fabric between the filter fabric support areas are designed to be large enough to accept water and fines but small enough to substantially prevent the filter fabric being pushed into its structure, thus reducing its capacity to transmit water. Furthermore, the tensile strength, and resistance to deformation, of the supporting sheet material should be capable of withstanding the earth pressures normally encountered in use.

A typical example of a subsurface drain in which an embodiment of the invention composed of the supporting sheet material with the non-woven filter fabric on one side only thereof may be used, is a cylindrical vertical drain. In this case, the laminated material is formed into a cylinder with the filter fabric exposed on the outside. This is positioned into a cylindrical hole in the ground and the interior of the cylinder filled with sand.

The embodiment of the invention which comprises the supporting sheet material, as a core or spacer, with the non-woven filter fabric on both sides thereof is particularly utilisable in a so-called prefabricated 'slot' drain. The latter consists of a slotted, water impermeable pipe with the laminated structure arranged vertically and inserted into the slot in the pipe. The filter fabric retains the soil and keeps the 'core' channels open, thereby allowing water to drain through the filter fabric, down the channels, and into the pipe. In a modification of this arrangement, a non-slotted, water permeable pipe is used, in which case the vertically arranged laminated structure also encloses the pipe.
The laminated structure with the filter fabric on both sides may be used as a simple vertical drain when cut or made into strips, say 9 inches wide, and the edges sealed to render them water impermeable.

The embodiment of the invention in which the laminated structure comprises a non-woven filter fabric on one side of the supporting material and an impermeable film on the other side may conveniently be used in the construction of a cut-off drain, in which the laminated structure is arranged vertically with the filter fabric facing the water flow.
The claims defining the invention are as follows:
1. A synthetic filter medium for use in prefabricated subsurface drains comprising a laminated structure formed by a supporting sheet material which exhibits high tensile and flexibility properties having bonded thereto, over at least one surface thereof, a filter sheet material, the filter material being a non-woven fabric comprising thermoplastic polymeric filaments or fibres bonded to one another and being sufficiently permeable to allow the passage of water therethrough while retaining soil, and the supporting material having a structural configuration whereby channels are formed between it and the filter material such that liquid, e.g., water, is free to flow therealong.

2. A filter medium according to claim 1 comprising the supporting sheet material with the non-woven filter fabric bonded to both sides thereof.

3. A filter medium according to claim 1 comprising the supporting sheet material with the non-woven filter fabric bonded to one side and an impermeable sheet material bonded to the other side.

4. A filter medium according to claim 3 wherein the impermeable sheet material is a synthetic polymeric film.

5. A filter medium according to any preceding claim wherein the bonding is thermal bonding.

6. A filter medium according to any preceding claim wherein the supporting sheet material is a thermoplastic plastics mesh-like material and the non-woven filter fabric is formed from filaments or fibres comprising synthetic, polymeric, thermoplastic, bicomponent filaments or fibres bonded together at their points of contact.

7. A filter medium according to claim 6 wherein the supporting sheet material and the non-woven filter fabric are bonded together by a flame bonding process.

8. Prefabricated subsurface drains which are formed from or incorporate a synthetic filter medium according to any one of claims 1 to 7.


PHILLIPS ORMONDE AND FITZPATRICK
Attorneys for:-
IMPERIAL CHEMICAL INDUSTRIES LIMITED