COMMONWEALTH OF AUSTRALIA

Patents Act 1952

CONVENTION APPLICATION FOR A STANDARD PATENT

I, KOUICHI NISHIMOTO, Momoyama Nagaoka Etchu Minamichō 53, Fushimiku, Kyotoshi, Kyoto, Japan, hereby apply for the grant of a Standard Patent for an invention entitled

"FLAME RETARDANT VEGETABLE FIBER MATERIAL AND THE PROCESS OF THE SAME"

which is described in the accompanying complete specification.

Details of basic application:

Number of basic application: 63-66149

Name of Convention country in which basic application was filed: Japan

Date of basic application: 18 March 1988

My address for service is: F.B. RICE & CO., 28A Montague St, Balmain N.S.W. 2041

Dated this 14th day of March 1989

KOUICHI NISHIMOTO
By: [Signature]
Registered Patent Attorney

TO: The Commissioner of Patents,
COMMONWEALTH OF AUSTRALIA
Commonwealth of Australia
The Patents Act 1952

DECLARATION IN SUPPORT

In support of the (Convention) Application made by:

KOUICHI NISHIMOTO, Momoyama Nagaoka Etchu Minamicho 53, Fushimiku, Kyotoshi, Kyoto, Japan

for a patent for an invention entitled:

FLAME RETARDANT VEGETABLE FIBER MATERIAL AND THE PROCESS OF THE SAME

I, (We), Kouichi NISHIMOTO

of and care of the applicant company do solemnly and sincerely declare as follows:

a) I am (We are) the applicant(s) for the patent.

Delete the following if not a Convention Application.

The basic application(s) as defined by section 141 (47) of the Act was (were) made

in Japan on March 18, 1988

by KOUICHI NISHIMOTO

The basic application(s) referred to in this paragraph is (are) the first application(s) made in a Convention country in respect of the invention the subject of the application.

a) I am (We are) the actual inventor(s) of the invention.

is (are) the actual inventor(s) of the invention and the facts upon which—
is (are) entitled to make the application are as follows—

Declarated at Kyoto this 6th day of March 1989

Signed Kouichi NISHIMOTO Status Applicant/Inventor
Declarant’s Name

F. B. RICE & CO PATENT ATTORNEYS
This form is suitable for any type of Patent Application. No legalisation required.
This invention relates to a flame retardant vegetable fiber material which is developed by the new technical and chemical treatments over an inherently inflammable fiber material such as pulp, cotton fiber and so on. It also relates to the process for the production of the same under the industrial mass production system with ease. This invention has realized the widely applicable technologies over the various industry fields - a technology to supply the filler for the building construction materials in stead of asbestos, rock fiber and glass wool as ever used, a technology to supply a flame retardant vegetable fiber board, a technology to supply various heat insulating and noise absorbing materials from a flame retardant vegetable fiber, and a technology to supply a flame-resistant paper as well as a technology to supply the new material for the use of the brake lining for automobile.
1. A flame retardant vegetable fiber material comprises an insoluble and incombustible inorganic compound adapted to be a setting dip and fixation among the gaps of the vegetable fiber.

5. The process for the production of a flame retardant vegetable fiber material, which comprises an insoluble and incombustible inorganic compound adapted to be a setting dip and fixation among the gaps of the vegetable fiber by the chemical reaction caused by; the vegetable fiber material is immersed either into an ionized inorganic compound water solution including at least one kind selected from a water soluable inorganic compound such as magnesium chloride, barium chloride or calcium carbonate, or else into an unionized inorganic compound water solution including at least one kind selected from a water soluable inorganic compound such as ammonium phosphate, ammonium pyrophosphate, ammonium magnesia or boric acid soda, whereafter the material is again immersed into the other different inorganic compound water solution.
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Address of Applicant : Momoyama Nagaoka Etchu Minamicho 53, Fushimiku, Kyotoshi, Kyoto, Japan
Actual Inventor : Kouichi Nishimoto

Complete Specification for the invention entitled:
"FLAME RETARDANT VEGETABLE FIBER MATERIAL AND THE PROCESS OF THE SAME"

The following statement is a full description of this invention including the best method of performing it known to Me:-
BACKGROUND OF THE INVENTION AND RELATED ART

This invention relates to a flame retardant vegetable fiber material which is developed by the new technical and chemical treatments over an inherently inflammable fiber material such as pulp, cotton fiber and so on. It also relates to the process for the production of the same under the industrial mass production system with ease. This invention has realized the widely applicable technologies over the various industry fields - a technology to supply the filler for the building construction materials in stead of asbestos, rock fiber and glass wool as ever used, a technology to supply a flame retardant vegetable fiber board, a technology to supply various heat insulating and noise absorbing materials from a flame retardant vegetable fiber, and a technology to supply a flame-resistant paper as well as a technology to supply the new material for the use of the brake lining for automobile.

As well known, the asbestos and rock fiber have been widely and generally used over the building industries because they have some inherent quality of incombustibility,
heat resistance, and thermal, noise insulation, and also they have been utilized for a flame-resistant paper as well as the brake lining of the automobile. Recently, however, the medical world warned strongly that afloat asbestos or rock fibers in the air might cause lung cancers among people when inhaled, and therefore it is now anxiously desired to develop a new and safe fiber material instead of the above asbestos and rock fiber.

In general the mineral fibers other than asbestos and rock fiber may have the quality for incombustibility and heat resistance, but they do not meet the conditions of light weight, thermal and noise insulation required for the building materials, and they also do not satisfy the quality of soft feeling, permeability and light weight which are required for a flame-resistant paper. On the other hand, in case if we use the mineral fibers except asbestos and rock fiber as the material for the brake lining of the automobile, the satisfactory result of the kinetic energy loading is not obtainable. In addition, the safety over the human health is required, for which it may be safely said that there will be found no proper fiber to satisfy all of the above requirements among the presently existing mineral fibers.

The present invention has an object to supply a flame retardant vegetable fiber material of long durability developed by the vegetable fiber and produced by putting some insoluble and incombustible inorganic compounds among the gaps of vegetable fiber tightly and fixedly, in stead of putting asbestos or rock fiber therewith in the prior art.

It has another object to supply a flame retardant
vegetable fiber material of inexpensive cost and of safe guard over the human health.

The invention has a further object to supply some novelty process of producing a flame retardant vegetable fiber material, which can be proceeded by the industrial mass production method, obtainable from vegetable fiber available in all areas and through the chemical treatments.

Other objects and advantages of this invention will become obvious upon reference to the accompanying descriptions taken in this specification.

SUMMARY OF THE INVENTION

The first inorganic compound solution and the second inorganic compound solution are prepared, both of which are in turn penetrating into the gaps of the vegetable fibers, wherein in the said gaps the first and second inorganic solutions are contacted and reacted each other, whereby the insoluble and incombustible inorganic compounds are generated and fixed, and finally a flame retardant vegetable fiber material is obtained thereupon.

DETAILED DESCRIPTIONS OF THE PREFERRED EMBODIMENTS

By this invention, two kinds of the inorganic compound solutions are put into the gaps of the vegetable fiber and contact each other therewith, whereon the insoluble and incombustible inorganic compounds are produced, and in order
to practise this embodiment, there are two types for preparing two kind solutions.

One type is dependent upon an ionized inorganic compound solution and an unionized inorganic compound solution, both of which produce the insoluble and incombustible inorganic compounds by mutual contact. The former ionized inorganic compound solution is for example: The solution such as magnesium chloride, barium chloride, calcium carbonate, aluminium chloride, aluminium borate and aluminium sulfate.

The latter unionized inorganic compound solution is for example: The solution such as ammonium phosphate, ammonium pyrophosphate, ammonium magnesia and boric acid soda.

The other type is based on two kinds of disperse phase colloidal solutions, both of which produce the insoluble and incombustible inorganic compounds by mutual contact. The first disperse phase colloidal solution is prepared by: Barium sulfate or barium phosphate is broken into micronization and thereafter dispersed into the water. The second disperse phase colloidal solution is prepared by: Calcium chloride is broken into micronization and thereafter dispersed into the water.

The followings are applicable as the vegetable fiber material by this invention:

Wood pulp (made from both needle leaved and broad leaved trees), straw, esparto, bamboo, flax, Manila hemp, edgeworthia papyrifera, wikstroemia sikokiana, paper mulbery, linter and so on. These materials are dealt with mechanical smashing to pieces before use.

Chemical pulp derived from the above material with
chemical procedure.
Semi-chemical pulp refined from the above material.
Regenerated pulp from wasted paper or scrap paper.

In general, the gap of the said vegetable fibers occupies several ten percent of their whole fiber cellular tissue, and especially this percentage figure shall come bigger in case of chemical pulp after excluding its lignin.

Now, the actual embodiments of this invention are now explained hereunder.

1. The first embodiment.
Prepared;
   a) saturated water solution of \( \text{MgCl}_2 \) as an ionized inorganic compound water solution, and
   b) saturated water solution of \((\text{NH}_4)_2\text{HPO}_4\) as an unionized inorganic compound solution.

Increased the temperature of the above mentioned ionized inorganic compound water solution between 40 degree C and 60 degree C, into which the swollen pulp in saturated state (the mechanical pulp made from a larch through smashing procedures) is immersed for 5 - 30 minutes, and then it is taken out of the relative solution for squeezing immersed liquid out, and next, for 10 - 80 minutes it is again immersed into the other prepared solution of an unionized inorganic compound solution with increased temperature between 40 degree C and 60 degree C, and finally it meets water washing and drying treatment.

As a result, the said pulp, having the increased weight
at 50 - 90 percent in comparison with the original weight as 100 under the absolute dry condition, becomes the flame retardant pulp.

The specimen of the ceiling board with the size of 910mm(Wide) X 1820mm(Long) X 12mm(Thick) was manufactured from the above processed pulp with piling and compressing mould. The specimen of the board was furnished with flame test at 1000 degree C for 20 minutes, and it did not catch a fire at all with some visible slight trace of scorch. In view of this field test, it was found that the mechanical pulp of a larch organized in itself a high flame retardant and flame resistant quality.

2. The second embodiment.

Prepared;

a) saturated water solution of MgCl₂ as an ionized inorganic compound water solution, and

b) saturated water solution of (NH₄)₂HPO₄ as an unionized inorganic compound solution.

Increased the said ionized inorganic compound water solution between 40 degree C and 60 degree C, into which several flakes of cryptomeria pieces swollen at 100% of moisture content rate are immersed for 5 - 30 minutes, and then they are taken out of the relative solution for squeezing liquid out, and next, for 30 minutes, they are immersed in the other prepared solution of an unionized inorganic compound solution with increased temperature between 40 degree C and 60 degree C, and finally it meets water washing and drying treatment.

After the said treatment, cryptomeria pieces are hot
pressed into a board shape mixed with polyimide resins agent, and the specimen of a particle board with the size of 900mm(Wide) X 900mm(Long) X 15mm(Thick) was manufactured. The relative specimen was furnished with fire resistant test at 1000 degree C for 20 minutes, and it did not catch a fire at all with some visible slight trace of scorch and with slight deformation. This field test proved that the tested material was quite proper for flame retardant building equipments.

3. The third embodiment.

Prepared:

c) $\text{BaSO}_4$ is broken into micornization with the size of $2\mu$ and dispersed into the water as the first disperse phase colloidal solution, and

d) $\text{Ca}_3(\text{PO}_4)_2$ [or else $\text{CaCl}_2$] is broken into micronization with the size of $2\mu$ and dispersed into the water as the second disperse phase colloidal solution.

Increase the temperature of the first disperse phase colloidal solution upto 40 degree C, into which the cotton fiber swollen at 1000% of moisture content rate is immersed for 10 - 30 minutes, and it is taken out of the said solution for squeezing immersed liquid out, and next, for 10 - 30 minutes, it is immersed in the second disperse phase colloidal solution with increased temperature of 40 degree C, and finally it meets drying treatment. As a result, the said cotton material increases its weight at 90 percent compared with the original weight of 100 under absolute dry condition, and this extra value of 90 is of incombustible
quality.

On the said processed cotton fiber a piece of cigarette with fire has been left until it comes to ashes completely. Almost no trace of scorch is found on the said surface therewith, which proves the superior flame resistance quality.

As explained in the said embodiments, this invention realizes the vegetable fiber material with flame retardant and heat resistant qualities. Furtherly, the obtainable flame retardant vegetable fiber material, when in comparison with the former mineral fiber, has various and useful features such as light weight, soft feeling and permeability (these two are the particularities of vegetable fiber), voluminously, recovering elasticity and high friction endurance, although it is somewhat heavier in weight compared with its original weight.

Therefore, when this newly developed vegetable fiber material is used as the thermal insulation or the noise insulation for the building equipments, it works quite well as the heat insulating material or the sound proof material respectively, and definitely some high efficiency for thermal or noise insulation is obtained. It is also an ideal for the fire protection construction material.

At the same time, when this vegetable fiber material is used as the filler for the cement board or the gypsum board, it works for flame resistance exactly same as the asbestos, and in addition, it is of quite light weight, and moreover it does not incur any cause for the lung cancer at all like the prior asbestos or rock fiber as adopted hence.
The pulp of the vegetable fiber obtained by this invention enables us with ease to produce the flame proof paper by the normal method, and this flame proof paper, in soft touch feeling and permeability, is superior to that produced from asbestos material.

Furtherly, this newly developed fiber material can endure against the high temperature more than 500 degree C, whereas it can be applied as the material of the brake lining for the motor car.

As explained so far, the present invention discloses the flame retardant vegetable fiber material equipped with both merits of vegetable and mineral fibers, and simultaneously eliminating defects of the said two fibers, and therefore, it is forecasted that this newly developed material might be used over the various fields of the industry.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A flame retardant vegetable fiber material comprises an insoluble and incombustible inorganic compound adapted to be a setting dip and fixation among the gaps of the vegetable fiber.

2. A flame retardant vegetable fiber material according to claim 1, in which the vegetable fiber comprises the pulp.

3. A flame retardant vegetable fiber material according to claim 1, in which the vegetable fiber comprises the flakes of the smashed wooden pieces.

4. The process for the production of a flame retardant vegetable fiber material, which comprises an insoluble and incombustible inorganic compound adapted to be a setting dip and fixation among the gaps of the vegetable fiber by the mutual contact of an ionized inorganic compound water solution and an unionized inorganic compound water solution.

5. The process for the production of a flame retardant vegetable fiber material, which comprises an insoluble and incombustible inorganic compound adapted to be a setting dip and fixation among the gaps of the vegetable fiber by the chemical reaction caused by; the vegetable fiber material is immersed either into an ionized inorganic compound water solution including at least one kind selected from a water soluble inorganic compound such as magnesium chloride, b淋ium chloride or calcium carbonate, or else into an
unionized inorganic compound water solution including at least one kind selected from a water soluble inorganic compound such as ammonium phosphate, ammonium pyrophosphate, ammonium magnesia or boric acid soda, whereby the material is again immersed into the other different inorganic compound water solution.

6. The process for the production of a flame retardant vegetable fiber material, which comprises an incombustible and incombustible inorganic compound, started to be setting up and fixation among the gaps of the vegetable fiber by the mutual contact of the first disperse phase colloidal solution and the second disperse phase colloidal solution therewith.

7. The process for the production of a flame retardant vegetable fiber material according to the above claim 6, in which the first disperse phase colloidal solution comprises a water solution caused by the micronized powder of bauxite sulfate dispersed into water, and the second disperse phase colloidal solution comprises a water solution caused by the micronized powder of calcium phosphate or calcium chloride dispersed into water.

Dated this 14th day of March 1989

KOUICHI NISHIMOTO
Patent Attorneys for the Applicant
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