PATENT SPECIFICATION

652,414

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PROVISIONAL SPECIFICATION
No. 1186 A.D. 1948.

Improvements in or relating to the Manufacture of Building or Roofing Elements

I, LIONEL CRESSON, a British Subject, whose post-office address is c/o Cressonite Industries Limited, Pasir Panjang, Singapore, do hereby declare the nature of this invention to be as follows:—

This invention relates to the manufacture of building and/or roofing elements having a basis of rubber.

It is one of the objects of the present invention to provide a building and/or roofing element having a substantial degree of rigidity. It is a further object of the invention to provide a process of manufacture whereby a substantially rigid building and/or roofing element may be prepared in the form of a corrugated sheet, slate or tile or bar.

According to the present invention there is provided a process for the manufacture of a building and/or roofing element having a basis of rubber, which process comprises compounding rubber, sulphur and fillers including inorganic fillers such as clay and/or sand and fibres such as asbestos or sisal the proportion of rubber in the mix being of the order of 30% and the proportion of sulphur of the order of 20%, forming the mix into the building and/or roofing element required and heating to bring about curing of the rubber to produce the degree of rigidity required.

The forming operation may be carried out under pressure and the forming and heating operations may be performed simultaneously.

In one example of the process for preparing a roofing element in the form of a corrugated sheet in accordance with the invention, a sheet formed from the mix is placed between two corrugated moulding plates or a number of sheets are stacked alternately with moulding plates. Pressure is applied to the faces of the outer moulding plates and the assembly of sheets is subjected to heat treatment for example with steam in an autoclave. This treatment is continued until the required degree of hardness and rigidity is attained.

In another example of the process for preparing a building element, say a door frame, in accordance with this invention, the mix is forced into moulds either by an injection process or by extrusion through dies to produce the sectional shape and dimensions required. In the first case, the injected mix is cured in the moulds *in situ* to the required degree of hardness and rigidity, whilst in the second case, the length of extruded mix sectionally shaped into a bar or strip of definite form is cut into lengths required and the door frame built up by joining the lengths together with the necessary cements or other adhesive medium, the whole then being subjected to heat for curing the mix to the required rigdity in a sand bath or on a water bath, heated to the necessary temperature.

The rubber used in carrying out the invention may be prepared by mastication from natural rubber, various fillers, reinforcing agents and plasticisers being incorporated. Alternatively the rubber used in the invention may consist of vulcanised or unvulcanised rubber latex. In the latter case the other ingredients may be admixed with the liquid rubber composition to give the mix required.

Building or roofing elements when prepared by the process according to the present invention have been found to have good thermal insulating properties, good resistance to atmospheric conditions, to be non-inflammable and to char less easily than timber.

[*Price 2/-*]

Revised Price 2s. 6d.

Dated this 14th day of January, 1948.

BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London, E.C.1,
Chartered Patent Agents.

PROVISIONAL SPECIFICATION
No. 3197 A.D. 1949.

Improvements in or relating to the Manufacture of Building or Roofing Elements

I, LIONEL CRESSON, a British Subject, whose post-office address is c/o Cressonite Industries Limited, Pasir Panjang, Singapore, do hereby declare the nature of this invention to be as follows:—

This invention is for improvements in or relating to the manufacture of building or roofing elements. In my Specification No. 1186/48 there is described a process for the manufacture of a building and/or roofing element having a basis of rubber, which process comprises compounding rubber, sulphur and fillers including inorganic fillers such as clay and/or sand and fibres such as asbestos or sisal the proportion of rubber in the mix being of the order of 30% and the proportion of sulphur of the order of 20%, forming the mix into the building and/or roofing element required and heating to bring about curing of the rubber to produce the degree of rigidity required.

I have now found that the proportion of sulphur may be substantially reduced below 20% and may in certain cases be omitted altogether and that the products still retain the desirable properties of those made in accordance with Specification No. 1186/48.

I have also found that the proportion of rubber in the mix may be reduced below 35% and in some cases substantially below 30% while still resulting in a building and/or roofing element having practically useful properties.

According to the present invention there is provided a process for the manufacture of a building and/or roofing element having a basis of rubber which process comprises compounding rubber with sulphur if necessary and with fillers, forming the mix into the building and/or roofing element required and subjecting the element to the conditions necessary to bring about the hardening of the rubber compositon to produce the degree of rigidity required.

The fillers may be inorganic fillers and among those which may be used may be mentioned sand, clay, cement, lead compounds or lime or mixtures of two or more of these substances.

The fillers may consist of or include fibrous fillers and among such fillers may be mentioned asbestos, sisal, coir, cotton, flax or sawdust.

There may be included in the composition a proportion of asphalt, bitumen or tar.

The compositions may also include proportions of those compounds normally associated with rubber in the preparation of commercial mixes e.g. anti-ageing compounds and accelerators.

The rubber employed in the present invention may consist of natural or synthetic rubber or a mixture of natural and synthetic rubber. The mix may also contain reclaimed rubber.

The rubber may be employed in the solid state in the form of sheet, crepe, slabs, blankets, crumbs or strips or in the liquid state in the form of a solution or cement made by dissolving or swelling the rubber in solvent such as naphtha or benzol. Alternatively it may be used in the form of a natural or artificial latex. Further, the rubber in either of the above forms may be employed in the vulcanised or unvulcanised state and when used in the vulcanised state sulphur may be omitted from the mix.

The rubber may be plasticised e.g. by mechanical mastication and/or by the application of heat with or without the addition of plasticising substances.

The composition may be conveniently sheeted between smooth calender rollers or between profiled rollers to give the desired sectional shape.

Hardening of the moulded composition may be carried out by heating between 50° and 150° C. and may be followed by immersion in cold water.

When the mix contains hydraulic cement the moulded article may be allowed to set while immersed in water after which the article may be air dried and subsequently heated in hot air e.g. at 50° C. to 120° C.

Elements made in accordance with the present invention may be coated with metallic flakes or dust to act as a protective and heat and light reflecting surface.

The invention may be applied with advantage to the production not only of roofing sheets, tiles or slates but also to roofing ridges and gutters and also to window and door frames.

Dated this 4th day of February, 1949.
BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London, E.C.1,
Chartered Patent Agents.

COMPLETE SPECIFICATION

Improvements in or relating to the Manufacture of Building or Roofing Elements

I, LIONEL CRESSON, a British Subject, whose post-office address is c/o Cressonite Industries Limited, Pasir Panjang, Singapore, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the manufacture of building and/or roofing elements having a basis of rubber.

It is one of the objects of the present invention to provide a building and/or roofing element having a substantial degree of rigidity made from a basis of rubber. It is a further object of the invention to provide a process of manufacture whereby a substantially rigid building and/or roofing element may be prepared in the form of a corrugated sheet, slate or tile or bar.

According to the present invention there is provided a process for the manufacture of a substantially rigid corrugated building and/or roofing element which process comprises compounding rubber with sulphur if necessary and with fillers, forming the mix into a sheet, placing the said sheet between two corrugated moulding plates and subjecting to heat and pressure.

A number of sheets of rubber compounded with sulphur and with fillers may be assembled alternately with corrugated moulding plates and the whole assembly subjected to heat and pressure.

The fillers may consist of or include inorganic or fibrous fillers. The inorganic fillers may comprise sand, clay, cement or lead oxide or lime or may comprise two or more of these substances.

Among the fibrous fillers may be mentioned asbestos or sisal or coir or cotton or flax or sawdust or of two or more of these substances. The rubber mix may contain a proportion of asphalt, bitumen or tar.

The rubber employed in the present invention may consist of natural or synthetic rubber or a mixture of natural and synthetic rubber. The mix may also contain reclaimed rubber.

The rubber may be employed in the solid state in the form of sheet, crepe, slabs, blankets, crumbs or strips or in the liquid state in the form of a solution or cement made by dissolving or swelling the rubber in solvent such as naphtha or benzol. Alternatively, it may be used in the form of a natural or artificial latex.

The rubber may be in the vulcanised or unvulcanised state and in the latter case vulcanising agent, e.g. sulphur, may be incorporated in the mix together with proportions of those compounds normally associated with rubber in the preparation of commercial mixes e.g. anti-ageing compounds and accelerators.

The proportion of rubber in the mix may conveniently be up to 35% by weight.

The rubber may be plasticised e.g. by mechanical mastication and/or by the application of heat with or without the addition of plasticising substances.

Hardening of the moulded composition may be carried out by heating between 50° and 150° C. and may be followed by immersion in cold water.

When the mix contains hydraulic cement the moulded article may be allowed to set while immersed in water after which the article may be air dried and subsequently heated in hot air e.g. at 50° C. to 120° C.

The rubber mix may also be formed into the building and/or roofing elements by extrusion or by extrusion followed by cutting and joining the extruded sections by means of adhesive.

Elements made in accordance with the present invention may be coated with metallic flakes or dust to act as a protective and heat and light reflecting surface.

Building or roofing elements when prepared by the process according to the present invention have been found to have good thermal insulating properties, good resistance to atmospheric conditions and to be light in weight, thereby reducing the costs of roof constructions.

Following is a description by way of example of methods of carrying the in-

vention into effect.

EXAMPLE I.

25 lbs. rubber was plasticised by mechanical mastication 5 lbs. asphalt being added to assist in this process.

50 lbs. clay, 10 lbs. sulphur and 10 lbs. lime were then mixed into the plasticised rubber by means of an open roller mixer.

The compound was then sheeted out between smooth calender rollers to produce a series of flat sheets. These sheets were placed between two corrugated moulding plates or a number of sheets were stacked alternately with corrugated moulding plates. Pressure was applied to the faces of the outer moulding plates and the assembly of sheets subjected to heat treatment with steam in an autoclave. After treating for 3 hours at 125° C. the corrugated sheets were subsequently immersed in cold water for 1 hour. The corrugated sheets now had the required degree of hardness and rigidity and could be used as roofing elements.

EXAMPLE II.

An alternative composition to that described in Example I consists of:—

Rubber - - -	30 lbs.
Asphalt - - -	5 lbs.
Clay - - -	35 lbs.
Sulphur - - -	20 lbs.
Lime - - -	10 lbs.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A process for the manufacture of a substantially rigid corrugated building and/or roofing element which process comprises compounding rubber with sulphur if necessary and with ~~rollers~~ fillers, forming the mix into a sheet, placing the said sheet between corrugated moulding plates and subjecting to heat and pressure.

2. A modification of the process as claimed in Claim 1 wherein a number of sheets of rubber compounded with sulphur and with fillers are assembled alternately with corrugated moulding plates and the whole assembly subjected to heat and pressure.

3. A process as claimed in claim 1 or claim 2 wherein the fillers consist of or include inorganic fillers.

4. A process as claimed in claim 1 or claim 2 wherein the fillers consist of or include fibrous fillers.

5. A process as claimed in claim 3 wherein the filler comprises sand or clay or cement or lead oxide or lime or of a mixture of two or more of these substances.

6. A process as claimed in claim 4 wherein the fibrous filler comprises asbestos or sisal or coir or cotton or flax or sawdust or of two or more of these substances.

7. A process as claimed in any one of the preceding claims wherein the rubber mix contains a proportion of asphalt, bitumen or tar.

8. A process as claimed in any one of the preceding claims wherein the rubber consists of natural rubber.

9. A process as claimed in any one of claims 1 to 7 wherein the rubber consists of synthetic rubber.

10. A process as claimed in any one of claims 1 to 7 wherein the rubber consists of reclaimed rubber.

11. A process as claimed in any one of the preceding claims wherein the rubber is employed in the solid form.

12. A process as claimed in any one of claims 1 to 10 wherein the rubber is employed in the form of a solution or cement.

13. A process as claimed in claim 12 wherein the solvent for the rubber is naphtha or benzol.

14. A process as claimed in any one of claims 1 to 10 wherein the rubber is employed in the form of a dispersion or latex.

15. A process as claimed in any one of the preceding claims wherein the rubber is employed in the vulcanised state.

16. A process as claimed in any one of claims 1 to 14 wherein the rubber is employed in the unvulcanised state a proportion of vulcanising agent is included in the composition.

17. A process as claimed in any one of the preceding claims wherein the proportion of rubber is up to 30% by weight on the weight of the composition.

18. A process as claimed in claim 11 or any one of claims 15 to 17 wherein the rubber is rendered plastic by heating or by mechanical working with or without the addition of plasticisers.

19. A process as claimed in any one of the preceding claims wherein the moulding of the mix is carried out at a temperature between 50° C. and 150° C.

20. A process as claimed in any one of the preceding claims wherein when the mix contains hydraulic cement the building and/or roofing element is allowed to set while immersed in water.

21. A process as claimed in claim 20 wherein the element is subsequently heated in hot air at 50° C. to 120° C.

22. A process as claimed in any one of the preceding claims wherein the corru-

vention into effect.

EXAMPLE I.

25 lbs. rubber was plasticised by mechanical mastication 5 lbs. asphalt being added to assist in this process.

50 lbs. clay, 10 lbs. sulphur and 10 lbs. lime were then mixed into the plasticised rubber by means of an open roller mixer.

The compound was then sheeted out between smooth calender rollers to produce a series of flat sheets. These sheets were placed between two corrugated moulding plates or a number of sheets were stacked alternately with corrugated moulding plates. Pressure was applied to the faces of the outer moulding plates and the assembly of sheets subjected to heat treatment with steam in an autoclave. After treating for 3 hours at 125° C. the corrugated sheets were subsequently immersed in cold water for 1 hour. The corrugated sheets now had the required degree of hardness and rigidity and could be used as roofing elements.

EXAMPLE II.

An alternative composition to that described in Example I consists of:—

Rubber - - -	30 lbs.
Asphalt - - -	5 lbs.
Clay - - -	35 lbs.
Sulphur - - -	20 lbs.
Lime - - -	10 lbs.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A process for the manufacture of a substantially rigid corrugated building and/or roofing element which process comprises compounding rubber with sulphur if necessary and with ~~rollers~~ fillers, forming the mix into a sheet, placing the said sheet between corrugated moulding plates and subjecting to heat and pressure.

2. A modification of the process as claimed in Claim 1 wherein a number of sheets of rubber compounded with sulphur and with fillers are assembled alternately with corrugated moulding plates and the whole assembly subjected to heat and pressure.

3. A process as claimed in claim 1 or claim 2 wherein the fillers consist of or include inorganic fillers.

4. A process as claimed in claim 1 or claim 2 wherein the fillers consist of or include fibrous fillers.

5. A process as claimed in claim 3 wherein the filler comprises sand or clay or cement or lead oxide or lime or of a mixture of two or more of these substances.

6. A process as claimed in claim 4 wherein the fibrous filler comprises asbestos or sisal or coir or cotton or flax or sawdust or of two or more of these substances.

7. A process as claimed in any one of the preceding claims wherein the rubber mix contains a proportion of asphalt, bitumen or tar.

8. A process as claimed in any one of the preceding claims wherein the rubber consists of natural rubber.

9. A process as claimed in any one of claims 1 to 7 wherein the rubber consists of synthetic rubber.

10. A process as claimed in any one of claims 1 to 7 wherein the rubber consists of reclaimed rubber.

11. A process as claimed in any one of the preceding claims wherein the rubber is employed in the solid form.

12. A process as claimed in any one of claims 1 to 10 wherein the rubber is employed in the form of a solution or cement.

13. A process as claimed in claim 12 wherein the solvent for the rubber is naphtha or benzol.

14. A process as claimed in any one of claims 1 to 10 wherein the rubber is employed in the form of a dispersion or latex.

15. A process as claimed in any one of the preceding claims wherein the rubber is employed in the vulcanised state.

16. A process as claimed in any one of claims 1 to 14 wherein the rubber is employed in the unvulcanised state a proportion of vulcanising agent is included in the composition.

17. A process as claimed in any one of the preceding claims wherein the proportion of rubber is up to 30% by weight on the weight of the composition.

18. A process as claimed in claim 11 or any one of claims 15 to 17 wherein the rubber is rendered plastic by heating or by mechanical working with or without the addition of plasticisers.

19. A process as claimed in any one of the preceding claims wherein the moulding of the mix is carried out at a temperature between 50° C. and 150° C.

20. A process as claimed in any one of the preceding claims wherein when the mix contains hydraulic cement the building and/or roofing element is allowed to set while immersed in water.

21. A process as claimed in claim 20 wherein the element is subsequently heated in hot air at 50° C. to 120° C.

22. A process as claimed in any one of the preceding claims wherein the corru-

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gated building and/or roofing element is given a protective and heat and light reflecting surface of metallic flakes or dust.

23. A process for the manufacture of a building and/or roofing element substantially as described in either of the specific examples hereinbefore set forth.

24. A building and/or roofing element when prepared by the process claimed in any one of the preceding claims.

Dated this 10th day of February, 1949.
BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London, E.C.1,
Chartered Patent Agents.

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