

PATENT SPECIFICATION

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(54) A METHOD OF PROTECTING AND PACKING FINISHED AND SEMI-FINISHED METALLURGICAL PRODUCTS

(71) We, ALUMINIUM PECHNEY a body corporate organised under the laws of France, of 28, rue de Bonnel, 69003, Lyon, France; do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The invention relates to a method of protecting and packing finished and semi-finished metallurgical products, in particular products made of aluminium alloys, for transportation.

15 This method can be applied to all finished and semi-finished products such as, for example, bars, profiles, cast or forged parts. However, it is particularly suitable for packing spools of aluminium or aluminium alloy wire rod, and the main feature of the description relates to packing for this product.

20 The aluminium or aluminium alloy wire rod is wire obtained by rolling, generally having a diameter of about 7.5 mm or of 9.5 mm, which is used as a raw material for manufacturing wire of smaller diameter by extrusion, intended for either electrical or mechanical applications, for example as conducting cables or grids. This wire rod is generally supplied in spools weighing from 1 to 2 tonnes. For a spool weighing 1 tonne, the external diameter is of the order of 1 metre and the height is of the order of 80 cm. This wire rod is not extruded in the factories where it is produced. It is therefore transported, in many cases over long distances and in conditions of transportation which are often difficult both from the climatic point of view (equatorial or tropical countries which are hot and humid) and from the mechanical point of view (much handling, sea transport).

35 This wire is relatively fragile. The humidity causes alumina to form on the surface and causes corrosion to set in. Impacts can damage the wire as a result of harsh contact with the strips which keep the coils close together or even as a result of the coils rubbing against each other.

However, this damage and these traces of corrosion, even if only superficial, cause breakages during extrusion since this type of deformation is very sensitive to superficial defects.

It is therefore extremely important to provide these spools of wire rod with a packing to protect the wire from contact with water in the form of rain, drips of water, sea water and also from mechanical impacts. This packing itself must resist sufficiently since otherwise the double protection of the wire would be illusory.

Numerous solutions have been proposed, such as tarred felt, polystyrene shells and a double-walled bag with a foam filling between the two walls. None of these solutions has turned out to be completely satisfactory. For example, although the polystyrene shells protect the wire from rubbing perfectly, they break in the event of a violent impact. The solution involving the double-walled bag is too difficult to carry out and impossible to automate.

We have discovered a method of packing wire rod which avoids the installation problems encountered in the former processes and which ensures effective protection against impacts and corrosion by water.

Thus, the present invention provides a method of packing a finished or semi-finished metallic product, which comprises packing the product in an envelope of retractable polyethylene film; retracting the film by heating at a temperature sufficient to cause it to become adherent to a polymer foam; and applying a layer of polymer foam to the retracted film, whereby the foam adheres to the film without the presence of an adhesive.

The invention also provides a laminate comprising a layer of retracted polyethylene, which has been retracted by heating at a temperature sufficient to cause it to become adherent to a polymer foam; and a layer of polymer foam, which adheres to the polyethylene without the presence of an adhesive.

Generally, a retractable polyethylene

cover is placed over the products, e.g. spools of aluminium alloy or aluminium wire rod, the spool/cover assembly is placed into a drying cabinet to cause the polyethylene to retract and then a mixture of polymerisable products is sprayed onto the retracted polyethylene to form a rigid foam. The foam layer may be of polyurethane, polyisocyanurate or phenol foam, and is preferably applied by a spray gun. The foam is generally several centimetres thick.

In order to pack a spool or wire rod by the method of the invention, a cover made of retractable polyethylene is first of all placed on the spool. The exact shape of this cover and, similarly, the location of the seams, is not of particular significance. For example, a cylindrical cover enveloping the entire spool may be used, but is preferable to use an annular cover making a free cylindrical space (shaft) in the centre of the spool. Once the cover has been applied, the polyethylene film forming the cover is retracted. For this purpose, the spool, coated with its cover, is placed in a drying cabinet regulated at a temperature of about 220°C, which varies depending upon the thickness of the film, for approximately 40 seconds.

When leaving the drying cabinet, the polyethylene film has retracted, causing the external coils and the strips to be tightened if the film is thick enough (of the order of 150 microns), preventing the strips from rubbing against the coils and preventing the coils from rubbing against each other and thus avoiding damage to the wire.

Once the wire rod is packed in a retracted polyethylene cover, it is protected effectively from the humidity and from damage caused by the strips rubbing against the wire. However, it is not protected from impacts, and the slightest tear in the polyethylene reduces these two advantages to nothing, since it spreads easily.

We have therefore conceived the idea of protecting this polyethylene cover by means of a thick plastics coating in the form of, for example, a rigid polyurethane or polyisocyanurate foam.

These products are already known in packing, where they are used for filling the empty spaces around fragile objects of irregular shape. They are produced either by a moulding technique or by spraying inside a chamber.

However, when protecting a spool externally, it is difficult to position this foam as it requires a double envelope within which the foam expands.

In devising the present invention we have shown that such a double envelope is useless. In fact, it is well known that polyurethane foam does not adhere to a non-retracted film of polyethylene since this

film is used as a product for removing moulded polyurethane from moulds. Nevertheless, we have surprisingly observed that the polyurethane adheres very strongly to a film of retracted polyethylene which has been retracted by heating to a sufficiently high temperature.

Given this knowledge, it is very simple to produce the packing forming the subject of the invention. Once the polyethylene cover has been applied to the spool, it is left to cool until it reaches a temperature of from 20° to 80°C and a rigid foam of 2 to 3 cm thickness is sprayed onto its external surface. This spraying is effected by a known technique with the aid of a spray gun. The spray gun comprises a mixing chamber into which are introduced two chemical components which combine as a result of their mutual interaction to form a polymer which is transformed into foam by a foaming gas-producing agent. The mixture which is still liquid is sprayed onto the cover. The period for polymerisation and for the formation of the foam, or creaming time, must be very brief, of the order of from 3 to 4 seconds, for example, to prevent the product from flowing.

As an example, in the case where the sprayed foam is a polyurethane foam, the two compounds are a polyalcohol and an isocyanate. The mechanical properties of the foam obtained are a function of the composition of each of the components and of their relative proportions. In order to produce a rigid foam having high resistance to impact, the nature and the relationship of the components should be selected so as to obtain a structure having 95% of closed cells. The apparent density of the rigid foam obtained in this way may vary from 30 g/litre to 100 g/litre and above. The mechanical properties improve significantly from 35 to 40 g/litre.

Polyisocyanurate foams or phenol foams may also be used for this purpose.

Thus, a shell of rigid foam which adheres strongly to the film of retracted polyethylene is obtained round the spool.

Spools which are protected by this packing complex of retracted polyethylene and polyurethane foam have been subjected to impact tests.

In the case of radial blows, for example mass blows applied to the external surface of the spool, a depression in the polyurethane foam, which is compressed by absorbing the energy of the mass, is observed. The polyethylene film is not torn and the wire is neither exposed nor marked.

In the case of tangential blows, the layer of polyurethane crackles at the surface without breaking and without becoming detached from its support.

This protective system may obviously

be used generally for packing finished or semi-finished products of any shape.

WHAT WE CLAIM IS:—

1. A method of packing a finished or
5 semi-finished metallic product, which comprises packing the product in an envelope of retractable polyethylene film; retracting the film by heating at a temperature sufficient to cause it to become adherent to a
10 polymer foam; and applying a layer of polymer foam to the retracted film, whereby the foam adheres to the film without the presence of an adhesive.
2. A method according to claim 1,
15 wherein the packed product is a spool of aluminium alloy or aluminium wire rod.
3. A method according to claim 1 or 2, wherein the foam layer is polyurethane, polyisocyanurate or phenol foam.
- 20 4. A method according to any one of claims 1 to 3, wherein the foam is applied

by a spray gun.

5. A method according to claim 1 and substantially as hereinbefore described.

6. A laminate comprising a layer of a 25 retracted polyethylene, which has been retracted by heating at a temperature sufficient to cause it to become adherent to a polymer foam; and a layer of polymer foam, which adheres to the polyethylene without the 30 presence of an adhesive.

7. A laminate according to claim 6, wherein the foam is a polyurethane, polyisocyanurate or phenol foam.

8. A laminate according to claim 6 and 35 substantially as hereinbefore described.

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ERRATUM

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Page 1, line 1, (71) *for* ALUMINIUM PECHNEY *read* ALUMINIUM PECHINEY

THE PATENT OFFICE
8th December, 1982