Nov. 25, 1969 P. M. STEIN 3,480,509

CONTINUOUS PRODUCTION OF HEAT-INSULATING SHEETS

Filed Sept. 12, 1966 2 Sheets-Sheet 1

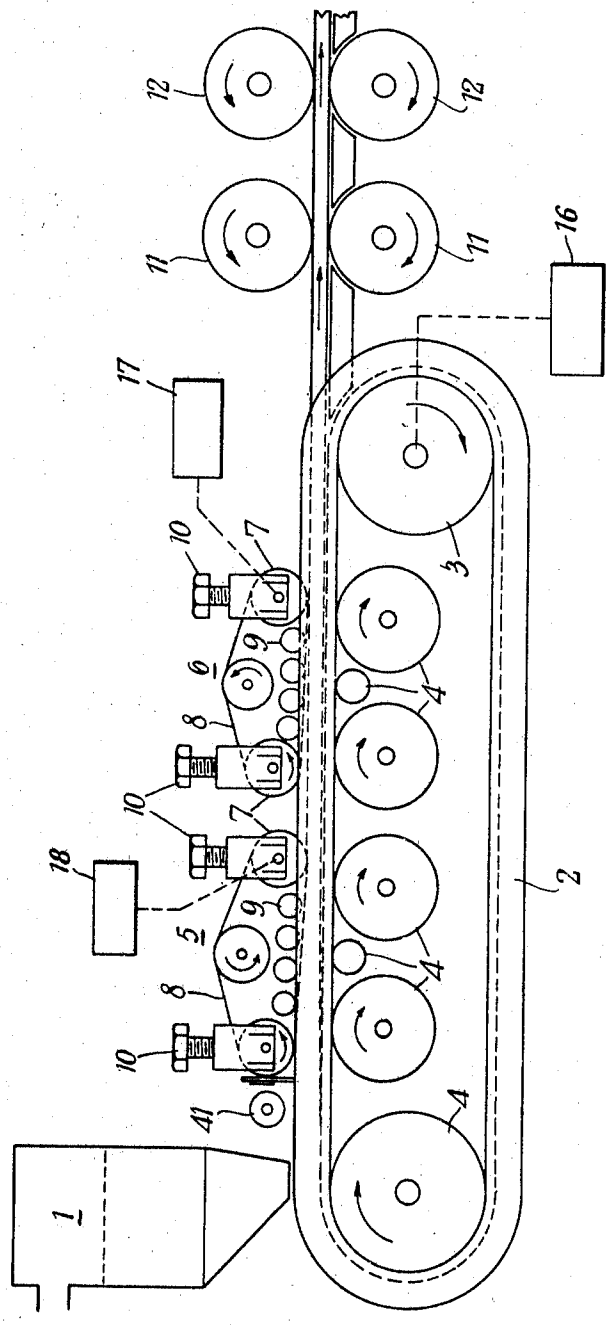


FIG. 1

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CONTINUOUS PRODUCTION OF HEAT-INSULATING SHEETS

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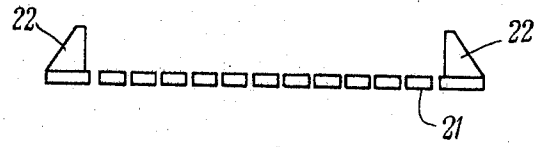


FIG.2

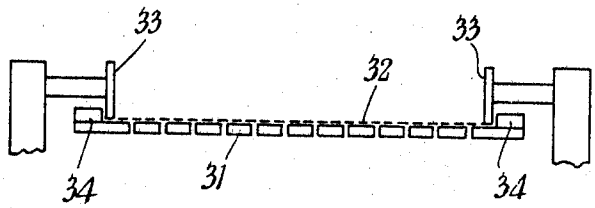


FIG.3

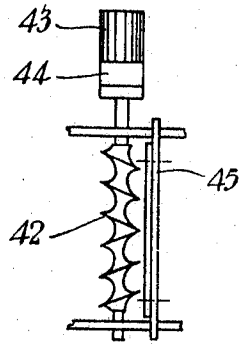


FIG.4

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CONTINUOUS PRODUCTION OF HEAT-INSULATING SHEETS

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Int. Cl. D21h 5/06
U.S. Cl. 162—309 6 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for the continuous production of refractory heat-insulating sheets from a slurry of refractory and fibrous ingredients including a slurry dispensing tank, an endless permeable support belt with lateral guide elements, adjustable pressure belts for compacting the slurry, and an Archimedean screw for evenly spreading the slurry on the support belt.

This invention relates to a method and apparatus for the production of continuous lengths of refractory heat insulating material.

In recent years refractory heat insulating compositions for use in slab form in the foundry and steel-making industries, have been developed which contain a particulate refractory material such as silica, e.g. as sand, fibrous organic material such as wood pulp, or paper pulp, and a binder therefor. Such compositions may contain, in addition, a fibrous refractory material, e.g. asbestos.

The normal mode of manufacture of slabs, sheets and other shapes from these compositions comprises forming a slurry of the ingredients in a liquid medium, usually in water, running this slurry into a mould, and compressing it therein, thereby to squeeze out water or other liquid medium and compact the solid materials together. The slabs and shapes thus formed are then cured by treatment in an oven which removes moisture and hardens the slab.

This method of manufacture is a batch-type method, individual slabs and shapes being formed to final shape and size in the mould. It is an object of the present invention to provide a method and apparatus whereby refractory heat-insulating material is produced in the form of a continuous sheet or strip for subsequent cutting or division into separate slab or like elements. The method has advantages in terms of economy and convenience.

According to a first feature of the present invention therefore, there is provided a method for the production of continuous lengths of refractory heat insulating composition containing particulate refractory material, organic fibrous material and a binder therefor, which comprises feeding an aqueous slurry of the said materials onto a water-permeable moving support belt having, laterally disposed of said support belt, guide elements defining the edges of said support belt, compressing the layer of slurry thereupon by means of one or more moving pressure belts in contact with said slurry layer, thereby exerting pressure on the slurry to expel water therefrom and yield a sheet or strip of the said composition in compressed form.

If desired, in the process of the invention the resultant strip of compressed composition may be passed between one or more sets of rollers, thereby further defining or modifying the shape of the compressed composition.

According to a further feature of the present invention there is provided apparatus for the production of continuous sheet or strip refractory heat-insulating material which comprises a support belt which is water-permeable, guide elements laterally disposed of said support belt serving to define the edges of said support belt and to

provide side walls thereto, means for continuously driving said support belt through a horizontal locus such that the support belt and guide elements together constitute a tray-like structure, means for continuously depositing aqueous slurry of refractory heat-insulating material onto said support belt, at least one endless pressure belt located above said support belt and adapted to exert pressure on the surface of slurry carried by said support belt, means for adjusting the angle of contact of said pressure belts with the said slurry surface, and means for driving the said pressure belts.

In the preferred form of the apparatus there is provided a plurality of moving pressure belts which contact with the top surface of the slurry, and exert pressure thereon, the angles of contact of said pressure belts with the slurry layer being adjustable, and the angle of contact of the belt first contacting the slurry layer capable of being made greater than that of the subsequent pressure belt or belts.

The foregoing apparatus may further include one or more sets of rollers through which the strip or sheet of compressed composition is constrained to pass and which may compress it further or modify its cross-sectional shape.

A suitable support belt may be made of metal gauze supported by a perforated rubber sheet. The moving support belt is preferably supported on a plurality of idler rollers, and may be driven by any convenient means. The guide elements disposed laterally of the moving support belt may be of integral construction therewith, preferably of rubber or a synthetic rubber, moulded to such as to provide a moving support belt with raised edges or, they may be in the form of fixed vertically disposed side walls. In the latter case the support belts may have raised side edges serving to locate the side walls so that their under edges make contact with the face of the support belt at its margins or the side walls may have short extensions inwardly of the support-belt and which lie under the marginal portion of the support belt.

The slurry may be fed onto the moving support belt by any of the normal methods well known in the art, for example, hoppers or breast tanks. If the slurry is not sufficiently fluid to spread evenly across the width of the support belt under gravitational forces it may be necessary to incorporate a spreading device between the feed device and the first pressure belt to distribute the slurry across the width of the support belt, possibly in conjunction with an adjustable gate or doctor device to control the thickness of the slurry layer.

The final shaping rollers when required may be of normal cylindrical construction and may be of rubber and generally serve to impart a finish to the surface of the emergent compressed strip or sheet.

The strip or sheet formed according to this invention may be fed directly through one or more ovens, or it may for example be cut into lengths and contoured and loaded onto trolleys for subsequent treatments, e.g. cambering, before being fed to ovens.

A specific embodiment of the method and apparatus of the invention will now be described with reference to the accompanying drawings in which:

FIGURE 1 illustrates diagrammatically a side view of apparatus according to the invention.

FIGURE 2 illustrates one form of cross section of the support belt.

FIGURE 3 illustrates an alternative form of cross section of the support belt, and

FIGURE 4 illustrates a detail of FIGURE 1.

Referring to FIGURE 1, a slurry storage and dispensing means such as tank **1** is provided over a support belt which is in the form of an endless belt **2**, a spreading and/or doctoring device **41** is optionally provided. This, as illus-

trated in FIGURE 4, may be in the form of a left and right hand Archimedean screw **42** rotating to distribute material deposited at the centre of the support belt towards the outer edges under the action of a motor **43** and reduction gear **44**, and provided with a doctor device **45**.

The endless belt **2** passes over a roller **3**, driven by suitable means **16** in the direction shown, and over idler belt support rollers **4**. Above belt **2** are two adjustable pressure belt assemblies **5** and **6**. The assemblies **5** and **6** each comprise a pair of rollers **7** (driven by means **17** and **18**) having mounted thereon belts **8** (a portion of which is in contact with the slurry on belt **2**), together with idler rollers **9**. The heights of the rollers **7**, and therefore of belts **8** above belt **2**, may be adjusted by means of screws **10**, as may be the angle between belts **8** and belt **2**. The angle between pressure belt **8** of belt assembly **6** and belt **2** is capable of being adjusted to be less than that between pressure belt **8** of belt assembly **5** and belt **2**.

Two pairs of shaping rollers, **11** and **12** are also provided. Referring to FIGURE 2 the endless belt **2** is made up of a stiff perforated rubber base **21**, having moulded thereupon or attached thereto, on each side of the belt, a soft rubber rim **22**.

In the alternative form of FIGURE 3 the endless belt **2** is made up of a perforated rubber base **31** having a gauze sheet **32** superimposed thereon. Side elements **33** are fixed to the structure of the apparatus and are stationary, and their lower edges make sliding contact with the margins of the upper surface of the belt **2**. The belt **2** has raised edges **34** which serve to maintain the belt **2** in location relative to the side elements **33**.

In the use of the apparatus, slurry is dispensed from tank **1** and falls onto belt **2**, travelling in the horizontal locus, and is spread out to the sides to fill the gap between the rims **22** or side elements **33**. The slurry then passes under the first pressure belt **8**, and the pressure exerted thereon squeezes out some of the water in the slurry, through the perforations in belt **2**. The less wet slurry now passes under the second pressure belt **8**, by means of which further water is removed. The resultant compressed strip, after emerging from the last pressure belt, is fed from the belt **2** to between the two pairs of finishing rollers **11** and **12**. After leaving these rollers the damp sheet passes to its next stage in manufacture, not shown, which may, for example, be a cutting or baking process.

I claim as my invention:

1. Apparatus for the production of a continuous sheet or strip of refractory heat-insulating material which comprises a water-permeable, endless support belt, guide elements laterally disposed of said support belt and serving to define the edges of said support belt and to provide side walls thereto, means for continuously driving said support belt through a horizontal locus such that the support belt and guide elements together constitute a tray-like structure, a slurry tank, for continuously depositing aqueous slurry of refractory material from said slurry tank directly onto said support belt, at least one endless pressure belt located above said support belt, a portion of which is in contact with the said slurry in order to compress the said slurry on the support belt, a left and right hand Archimedean screw located between said slurry tank and said pressure belt for spreading said slurry evenly on said support belt, means for adjusting the angle of contact between said pressure belt and said support belt, and means for driving said support belt and pressure belt.

2. Apparatus according to claim **1** wherein the guide elements are attached to the support belt.

3. Apparatus according to claim **1** wherein the guide elements are stationary and make sliding contact with the margins of the support belt as the support belt is driven.

4. Apparatus according to claim **1** wherein the support belt is of perforated rubber.

5. Apparatus according to claim **1** wherein the support belt comprises a metal gauze.

6. Apparatus according to claim **1** including at least one set of finishing rollers for smoothing or modifying the cross section of the refractory sheet after it emerges from the last pressure belt.

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U.S. Cl. X.R.

162—210, 305, 314, 353, 361