Feb. 18, 1969 A. T. LOVEGREEN 3,428,164

CONVEYOR BELTS

Filed April 26, 1967 Sheet 1 of 3

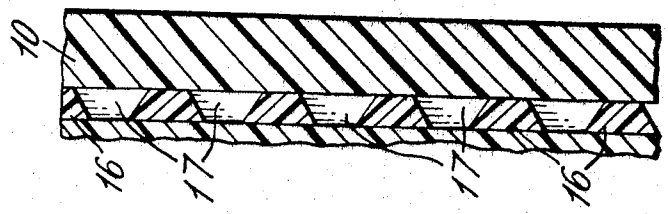


Fig. 4.

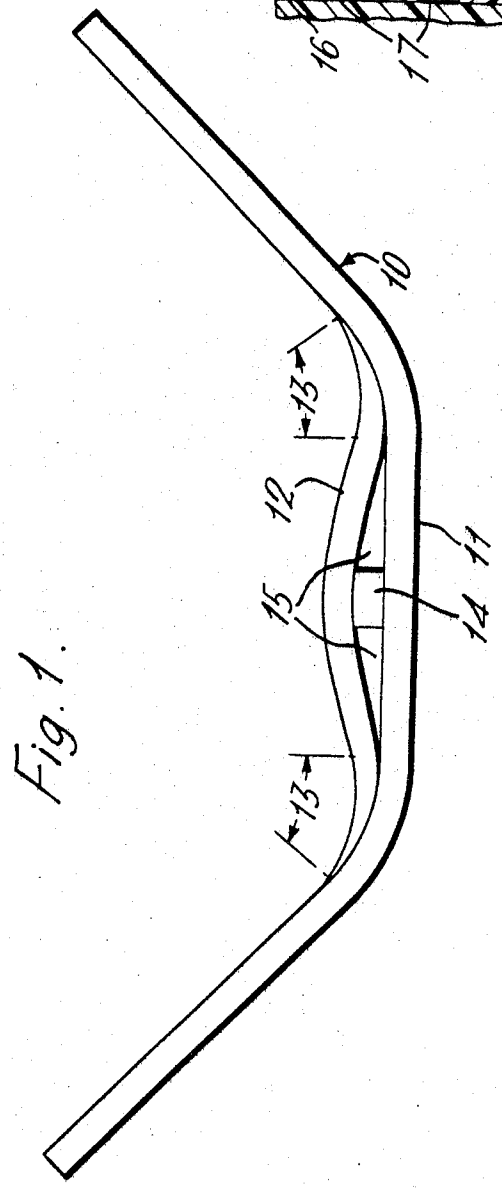


Fig. 1.

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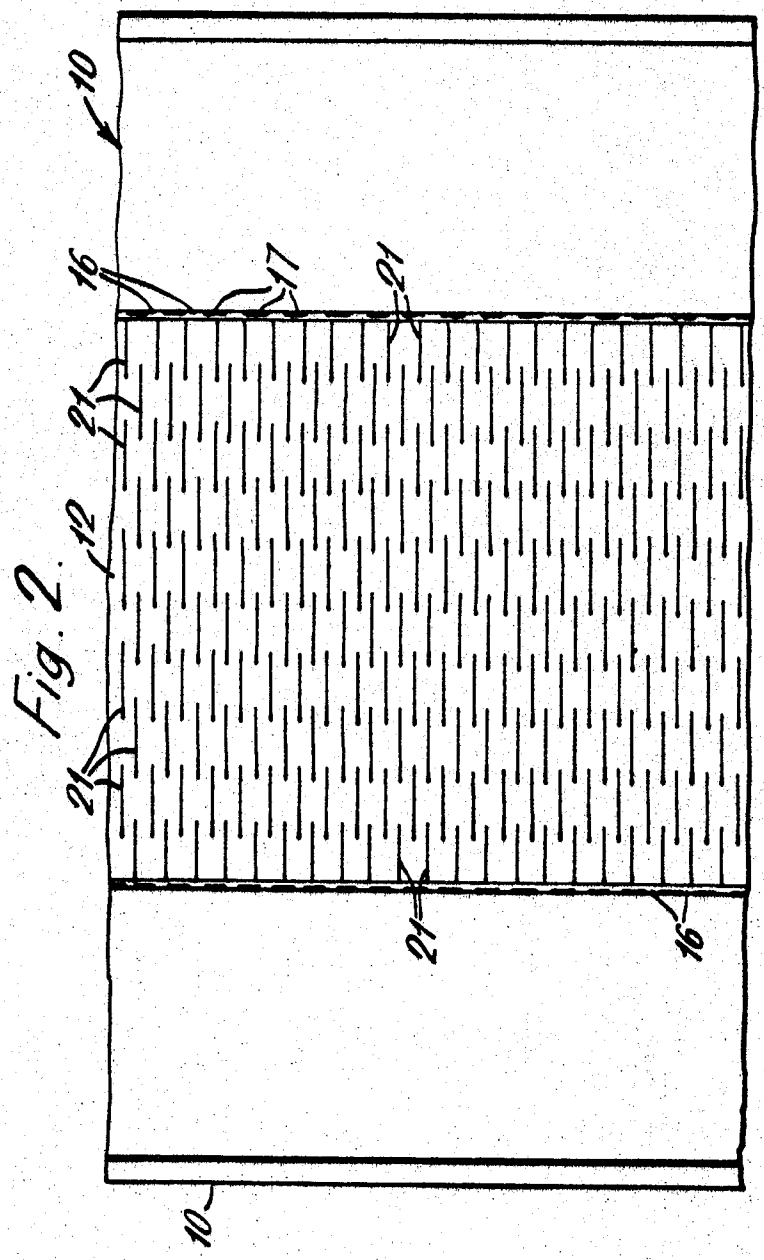


Fig. 2.

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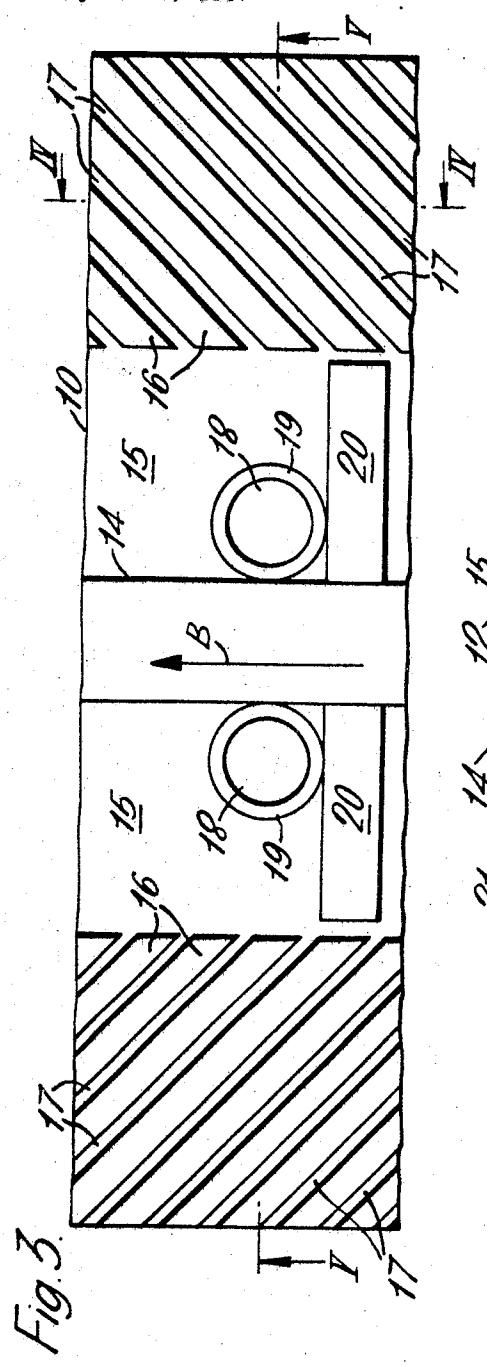


Fig. 3.

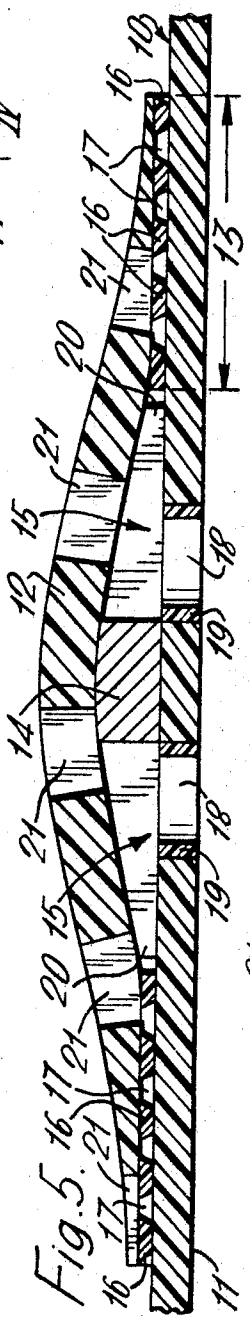


Fig. 5.

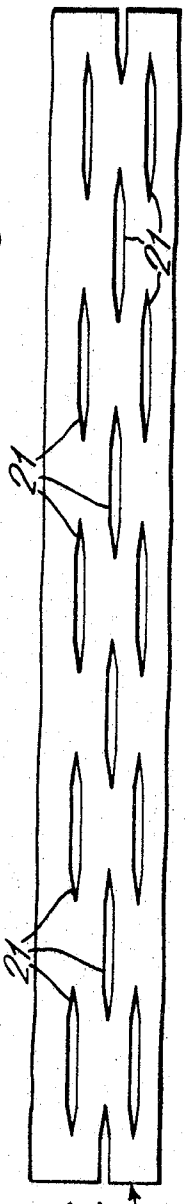


Fig. 6.

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3,428,164

CONVEYOR BELTS

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U.S. Cl. 198—193 7 Claims
Int. Cl. B65g *15/30;* B01d *33/04*

ABSTRACT OF THE DISCLOSURE

A conveyor which also serves to remove excess moisture from a granular or particulate load consists of a belt which is normally troughed on its working flight and which is pierced by drainage holes at intervals along the length of the central zone. Over this central zone is superimposed a perforated strip running the full length of the belt and bonded thereto along the side margins of the strip, the perforations serving to retain particles of a given minimum size whilst allowing the passage of liquid. Between its bonded margins, the strip is raised above the surface of the central zone of the belt to provide a longitudinal drainage duct. Gullies traverse the bonded zone to convey liquid from the surface of the belt beyond the perforated strip to the longitudinal duct.

This invention relates to conveyor belts and has for an object to provide a construction of belt which will facilitate the removal of moisture from a wet granular or particulate load. One typical application of the invention is to conveyor belts used in the sand and gravel industry for the transport of water-laden sand or gravel between units of a quarrying and processing plant.

For example, after sand and gravel have been classified with the aid of large volumes of water, it is necessary to allow the solids to drain in order that when they leave the quarry the material conforms to certain conventional requirements. By the use of a conveyor belt which also permits the escape of excess water from the material carried, the drainage time may be reduced from days to minutes, and the power requirements of the dewatering equipment reduced by up to two thirds.

The present invention aims at removing the bulk of the water from wet sand during its period of transportation on a conveyor belt by securing to the belt over a central longitudinal tract of the load bearing surface of the belt, a perforated strip which is, at least as regards the greater part of its width, spaced from the load-bearing surface so as to provide one or more longitudinal drainage ducts for water passing through the perforated strip. The belt itself is pierced at intervals to form outlets for escape of the water collecting in the drainage duct.

Preferably, the perforated strip is secured—as by adhesive or welding—to the load-carrying surface of the belt at zones running along each margin of the strip, and it is also preferred to provide gullies which traverse each marginal zone and which open at their outer ends on the surface of the belt and at their inner ends into the drainage duct.

The gullies are conveniently formed by transverse ribs or grooves formed either in the perforated strip or in the belt, or both, when the two are bonded together. Alternatively, the transverse ribs or grooves may, if preferred, be formed in a separate band which is bonded to both the strip and the belt.

Advantageously, the perforated strip is spaced from the belt by means of a central longitudinal rib or series of spacer blocks so that the strip is slightly "hogged" or upwardly convex along the top flight of the conveyor

belt when seen in transverse cross-section. This forms a generally triangular-section drainage duct or, where a central rib forms the spacer, a pair of such ducts running along each side of the rib. A transverse partition, which may also form a spacer, may be located adjacent each outlet in the belt, on the side of the outlet toward which water will normally run during use of the belt, so as to prevent the risk of water bypassing the outlet. Outlets may be formed in the belt on each side of a partition so that the belt can be laid on an inclined flight sloping in either direction, thus avoiding selective assembly.

Practical embodiments of the present invention will now be particularly described, by way of example only, with reference to the accompanying drawings in which:

FIGURE 1 is a schematic transverse profile of the top flight of a belt according to the present invention;

FIGURE 2 is a fragmentary plan view of a belt;

FIGURE 3 is a view similar to FIGURE 2 with the perforated strip removed;

FIGURE 4 is a section on the line IV—IV in FIGURE 3;

FIGURE 5 is a fragmentary transverse section on the line V—V in FIGURE 3, and showing the perforated strip in position, and

FIGURE 6 is a fragmentary plan view of the perforated strip.

Referring first to FIGURE 1 of the drawings, a conveyor belt **10** according to the present invention has its central tract **11**, which is normally flat on the top flight, overlaid by a perforated rubber or like strip **12** which is secured, by adhesive bonding, welding, or in any other suitable manner, along each marginal zone **13** to the load-bearing surface of the belt. The perforated strip **12** is "hogged" or rendered upwardly convex between the marginal zones **13** by the interposition, between it and the flat central tract **11**, of a central longitudinal rib **14**. This construction thus results in the formation of a pair of longitudinal drainage ducts **15**, one on each side of the rib **14**, each of which is of generally triangular shape in cross-section. As seen in this general profile view, the marginal zones **13** of the perforated strip are chamfered in order to reduce the height of the step along each edge of the strip **12** and to increase the flexibility of the assembly where the belt **10** is troughed in conventional manner along its top flight.

Referring now to FIGURES 2–6, when the perforated strip **12** is secured to the belt **10**, a tool (not shown) consisting of a series of prongs is interposed between the mating surfaces at an oblique angle to the centre line of the belt. The mating surfaces are then pressed together—preferably under heat—so that the prongs form ribs **16** and grooves or gullies **17** which traverse the full width of each marginal zone **13**. The tool is then withdrawn, leaving the gullies **17** running obliquely across the bonding zones **13** between the strip **12** and the belt (FIGURE 3). Thus, water draining from wet material on the inclined flanks of the belt **10** passes through the gullies **17** into the adjacent drainage duct **15**. (For convenience of illustration in FIGURES 3–5, the ribs **16** and gullies **17** are represented as a separate layer between the belt **10** and the strip **12**, although it will be understood that the tool will form each rib and gully partly in one and partly in the other of the mating surfaces.)

In an alternative process, a separate obliquely ribbed layer may be interposed between the mating surfaces of the belt **10** and the strip **12** for simultaneous bonding to both so as to perform the dual function of joining the strip to the belt and providing the required drainage from the inclined flanks of the belt to the central drainage duct **15**.

The belt **10** has outlet holes **18** which pierce the belt

at intervals on either side of the rib **14**, and these holes are preferably lined with bushes **19** of hard rubber or plastic to prevent fraying of the edges of the holes. For the direction of upward inclination of the belt **10** represented by the arrow B in FIGURE 3, a transverse partition **20** of generally triangular shape spans each duct **15** behind and closely adjacent to each outlet hole **18**. Each partition may act as a support for the perforated strip **12**, and its inner end abuts the central rib **14**. The partitions **20** ensure that water which collects in each section of a duct **15** between successive outlet holes **18** is prevented from bypassing the adjacent hole during transport of a wet load on the top flight conveyor.

The perforations of the strip **12** are in the form of narrow transverse slits **21** formed in staggered rows, as shown in FIGURES 2 and 6. They may be made in any convenient manner, such as by means of a series of thin sharp blades projecting from a platen by which they are pressed through the cured or hardened strip **12**. They can be opened out to any desired width or mesh size by stretching the perforated strip longitudinally and maintaining it in its stretched state during bonding to the bands **16**. The edges of the slits **21** on the underside of the strip **12** may be chamfered after piercing by means of a conical-end carborundum wheel or in any other convenient manner. As the belt **10** passes over an end roller of the conveyor, these slits will open to release any entrapped particles of sand, and the self-cleaning process can be encouraged by playing jets of water onto the strip **12** as it wraps around an end roller.

In use, when wet sand or other granular material is fed onto the top flight of the belt **10**, the water percolates between the sand particles into the slits **21** or, for that portion of the charge resting on the inclined flanks of the belt **10**, into the gullies **17**. Thence the water enters the ducts **15** and is discharged to waste through the outlet holes **18**. To prevent re-entry of discharged water into the ducts **15** through the holes **18** in the lower return flight of the belt, a gutter or deflector plate may be mounted between the flights.

In tests on a sample length of belt made in accordance with the present invention, the water content of a load of sand was reduced from 27% to about 13% in two minutes.

As water seeps out of the load on the conveyor belt, cracks and voids will form in the mass which both assist in accelerating the escape of further water and render the load more friable so that eventual discharge under gravity at the discharge end roller is facilitated.

In a modification, the gullies **17** are formed integral with the underside of the bonding zone **13** along each margin of the perforated strip. This may be achieved by passing the uncured strip between appropriately contoured rolls, or pressing it in discrete lengths between platens. Alternatively again, the gullies may be moulded or rolled in the load-bearing surface of the belt **10** during or prior to the mounting of the perforated strip **12**.

The perforations **21** may be moulded into the strip **12**, and may be tapered from the under to the upper side of the strip so as to improve the self-cleaning action. Hard inserts may be used to line the slits in a manner similar to that described above with reference to the outlet holes **18**.

In another modification, the perforated strip is built up from a series of curved or part-annular strips of a

width equal to the pitch (lengthwise of the belt) of the slits **21** and bonded together at the intervals between adjacent slits in any one transverse row. When such a bonded assembly is subjected to slight axial tension, the unbonded zones between pairs of adjacent curved strips separate to form slits. If these strips are of sufficiently stout construction, and sufficiently curved, to carry the load, the central rib **14** may be dispensed with, the transverse partitions **15** serving to afford the necessary stability and bracing against distortion. In this form of construction, the gullies **17** can be provided by enlarging those slits which normally open through the edges of the stack of assembled strips, or intermediately.

I claim:

1. A unitary conveyor element for wet granular materials comprising a load-bearing belt, a perforated strip of similar load-carrying material of less width than the load-bearing belt and symmetrically secured at its longitudinal marginal zones to the load-bearing belt and spaced therefrom between the said marginal zones to form a drainage duct, and drainage apertures formed through the load-bearing belt in register with the drainage duct.

2. A conveyor according to claim **1** wherein the perforated strip is secured to the belt over a marginal zone of the strip having a finite width, and each marginal zone is traversed by gullies communicating between the load-bearing belt surface beyond the marginal zones of the perforated strip and the drainage duct.

3. A conveyor according to claim **2** wherein the gullies are constituted by depressions formed in the mating surfaces of the load-bearing belt and a marginal zone of the perforated strip.

4. A conveyor according to claim **2** wherein the gullies are formed in a separate element interposed between the load-bearing belt and a marginal zone of the perforated strip, and co-extensive with the said zone.

5. A conveyor according to claim **2** wherein the perforated strip is spaced from the load-bearing belt by a transverse wall located adjacent a drainage aperture to constitute means for deflecting liquid in the drainage duct into the drainage aperture.

6. A conveyor according to claim **1** wherein the load-carrying surface of the load-bearing belt is troughed on an upper flight of the conveyor to present sloping side walls and a substantially flat central zone, and the perforated strip spans the said central zone and tapers in thickness over each marginal zone.

7. A conveyor according to claim **1** wherein the perforated strip has a plurality of laterally elongated slits arranged in mutually staggered transverse rows to constitute the perforations, the width of each slit being small compared with its length and of a dimension less than the size of the smallest particle of the wet granular load material which it is desired to retain on the conveyor.

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U.S. Cl. X.R.

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