Nov. 23, 1954 W. D. DODENHOFF 2,694,834

SPIKED APRON FOR TEXTILE EQUIPMENT

Filed April 17, 1951

2 Sheets-Sheet 1

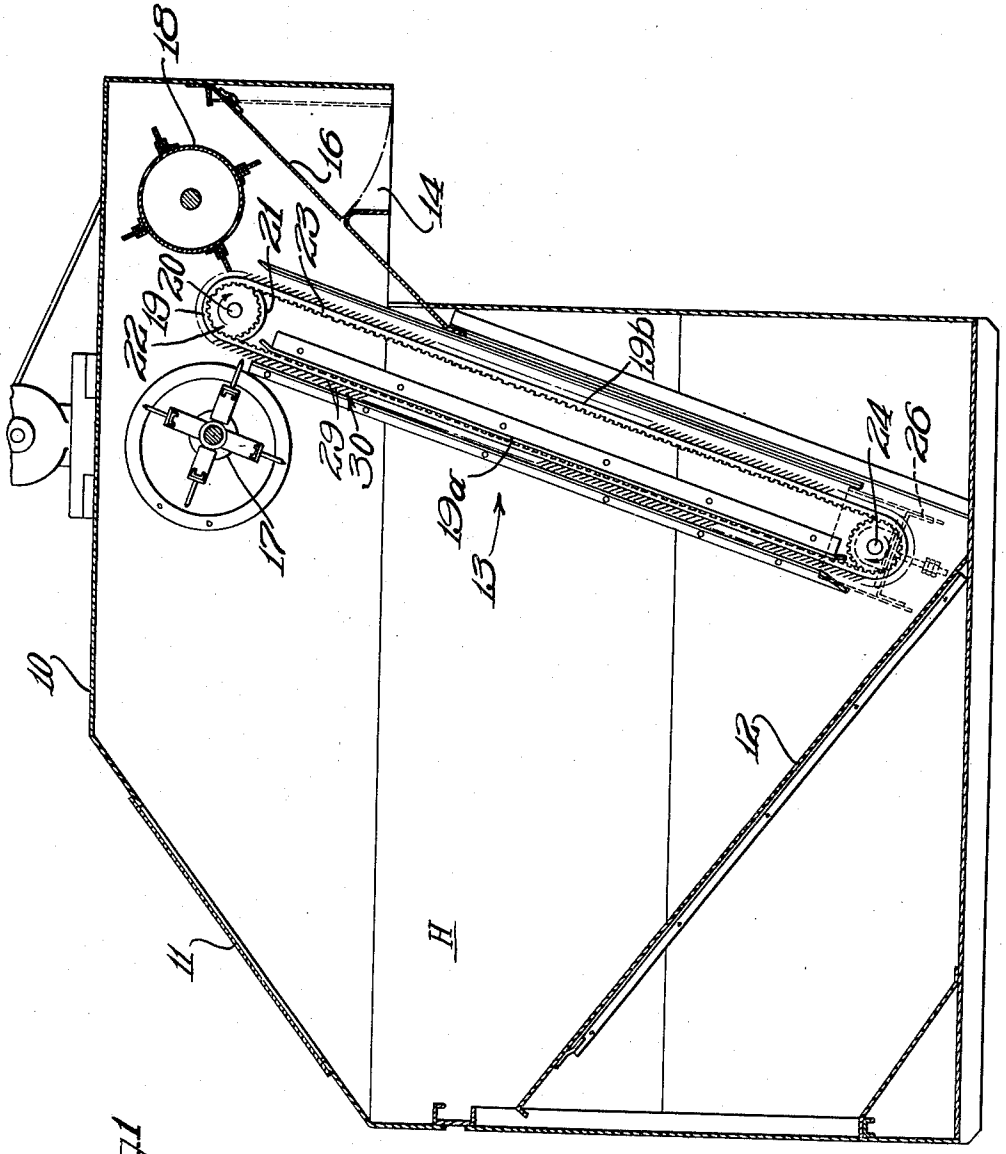


Fig 1

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2 Sheets-Sheet 2

Fig. 2

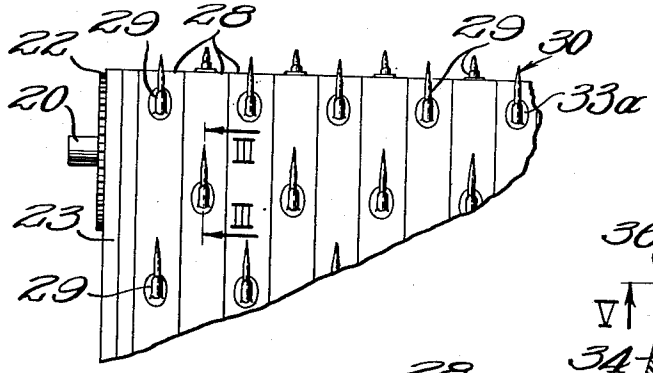


Fig. 4

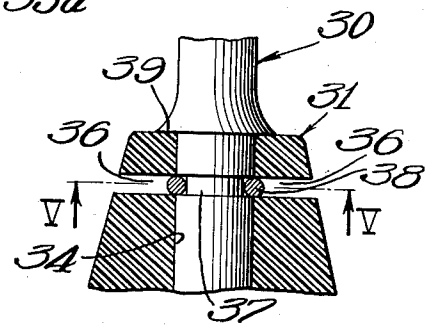
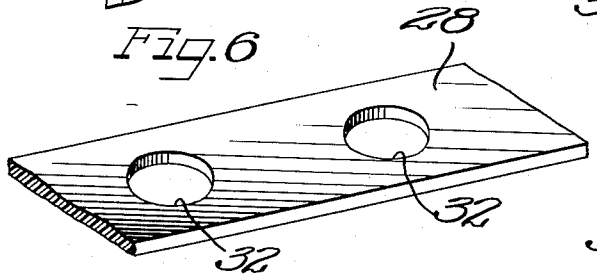


Fig. 5

Fig. 6



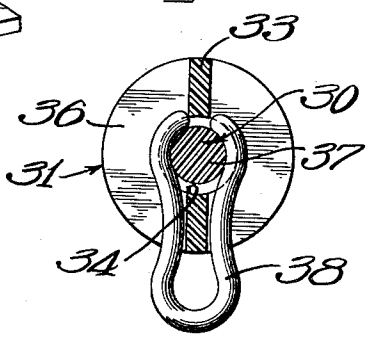
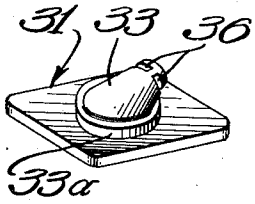


Fig. 7



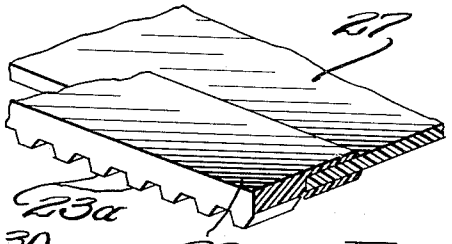
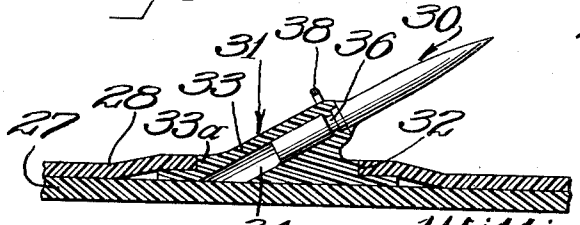


Fig. 3

Fig. 8



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SPIKED APRON FOR TEXTILE EQUIPMENT

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Application April 17, 1951, Serial No. 221,497

16 Claims. (Cl. 19—79)

This invention relates generally to textile equipment, and more particularly to an improved non-sparking spiked apron having replaceable spike means and constructed to withstand unusual operating stresses and strains.

Conveyor equipment of the type including spiked aprons is widely used throughout the textile industry in various applications wherein quantities of fibers and other materials to be conveyed are moved for purposes of transit or for purposes of treating the fibers in the course of fiber preparation. In this connection, spiked conveyor aprons are frequently employed to open and fluff quantities of fibers by carrying the fibers in proximity to a rapidly oscillating or revolving element such as a comb.

Most of the spiked conveyor aprons heretofore provided have included a canvas belt backing to which are attached transversely extending wooden slats spaced apart longitudinally with respect to one another. The slats are provided with a plurality of steel pins set at a predetermined material engaging angle. Leather belts are frequently riveted to the underside of the canvas backing in order to provide the necessary traction surface used for driving the conveyor apron and for providing a more positive support for the spaced slats.

In operation, the rotating elements of a textile machine are sometimes set too close to the conveyor apron through inadvertence or because of unexpected operating conditions. As a result, sparks are readily struck upon engagement of the metal pins provided on the apron with the metal components of the other rotating elements. Since the conveyor aprons are frequently used in connection with moving highly combustible material, extensive fires sometimes result with consequent damage occurring to the conveyor apron, the material being conveyed and the machine associated with the structure.

The conveyor aprons heretofore provided have exhibited other deficiencies in that impact with heavy lumps of fibers or other obstacles will frequently cause the spike-like pins affixed to the wooden slats to be dislocated. If the pins are actually knocked out and enter into the stream of fibers, they are likely to cause further damage in passing through processing machinery employing high speed rotating devices. Sometimes when the pins are not actually knocked out of assembly with the conveyor apron the wood slats will be split and an entire row of pins will be knocked out of alignment.

Another disadvantage of the conveyor aprons heretofore provided is that the canvas backing material and the leather belts employed in connection therewith frequently stretch, therefore requiring continual pulley adjustment in order to afford proper operating conditions in the textile machinery employing such apron constructions.

Metal conveyor aprons have also been heretofore provided. However, such aprons are expensive to manufacture and, in order to afford the necessary flexibility, must necessarily comprise a plurality of separate joints linked together. Such constructions have entailed considerable difficulties when applied to the environment of the textile industry. Lint frequently collects in the link joints and eventually causes distortion or breakage of the joints or belt sections. It will also be recognized further that the employment of all-metal aprons actually increases the fire hazard in a textile mill because of the tendency of rotating parts to strike sparks upon engagement therewith.

In accordance with the principles of the present invention, an improved spiked conveyor apron is fabricated from non-sparking material such as a flexible non-metallic material, for example, a suitable plastic. An exemplary structure might include a flexible sheet made of woven fiber glass forming a backing member to which may be bonded a plurality of transversely spaced strips of plastic material or fabric of suitable construction.

A plurality of non-sparking pin retainers are assembled to the strips and each of the pin retainers is provided with an angularly inclined bore open at one end to receive in removable assembly therewith a molded plastic or aluminum pin having a projecting spike portion adapted to engage the material to be conveyed. A snap ring or other suitable locking means is provided to lock the pins in the bore of the pin retainers.

To insure positive driving of the apron, a flexible rack may be bonded to one edge of the apron for meshing with a molded plastic pinion gear carried by the driving shaft of the particular machine with which the conveyor apron is associated.

It is an object of the present invention, therefore, to provide a spiked conveyor apron which overcomes the deficiencies of spiked conveyor aprons heretofore provided.

Another object of the present invention is to provide a spiked conveyor apron structure which will more adequately distribute the resistance forces encountered by the spikes on the apron.

Yet another object of the present invention is to provide a spiked conveyor apron having readily replaceable pin spikes.

A further object of the present invention is to provide an improved conveyor apron incorporating a positive drive connection.

A further object of the present invention is to provide a conveyor apron in which stretching is minimized.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description which follows in the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of my invention is set forth.

On the drawings:

Figure 1 is a cross-sectional view of a typical piece of textile equipment used in preparing fibers and incorporating a spiked conveyor apron constructed in accordance with the principles of the present invention;

Figure 2 is a fragmentary elevational view of the spike conveyor apron provided in accordance with the principles of the present invention;

Figure 3 is a fragmentary cross-sectional view, with parts shown in elevation, taken substantially on line III—III of Figure 2;

Figure 4 is an enlarged fragmentary cross-sectional view, with parts shown in elevation, illustrating additional details of construction and showing how the pin provided in accordance with the principles of the present invention is locked in the pin retainer;

Figure 5 is a fragmentary cross-sectional view taken substantially on line V—V of Figure 4;

Figure 6 is a fragmentary isometric view of the strips provided in accordance with the principles of the present invention;

Figure 7 is an isometric view of one of the pin retainers provided in accordance with the principles of the present invention; and

Figure 8 is a fragmentary isometric view, with parts broken away and with parts shown in cross-section, showing the flexible rack bonded to one side of the spiked conveyor apron provided in accordance with the principles of the present invention.

As shown on the drawings:

The structure shown in Figure 1 depicts a typical piece of textile equipment used in handling and preparing fibers and incorporating a spiked conveyor belt which may be constructed in accordance with the principles of the present invention. As shown in Figure 1, a casing **10** is provided having an access door **11** providing an opening for a hopper H adapted to receive a mass of fibers therein. An inclined floor **12** is provided for the hopper H to direct the mass of fibers toward a conveyor indicated generally by the reference numeral **13** by

means of which the fibers may be carried from the hopper H to a discharge opening **14** controlled by a valve plate **16**.

A rotary comb **17** is supported in the upper portion of the casing **10** adjacent the conveyor **13** to assist in the treatment of the fibers and a doffer **18** is also provided to assist in removing the fibers from the conveyor **13** in the locale of the discharge opening **14**.

In this particular application, the conveyor **13** comprises an endless loop belt **19** having one leg **19***a* moving upwardly and a second leg **19***b* moving downwardly. A conveyor drive shaft **20** is equipped with a pulley wheel **21** to drive the conveyor **13**, and a positive drive connection is provided by securing a gear plate **22** to the drive shaft **20** for meshing engagement with a flexible rack **23** connected to one side of the conveyor belt **19**. The gear plate **22** may be made of any suitable non-sparking material, for example, a molded plastic gear plate is advantageously employed.

The other end of the conveyor belt **19** is looped around an idler pulley carried by an idler shaft **24** journaled in an adjustment mechanism **26** supported by the casing **10**.

Referring now to Figures 2–8, the structural features of the spike conveyor apron provided in accordance with the principles of the present invention will be explained. A backing member **27** is provided comprising a sheet of flexible material which, by way of illustrative example, may advantageously take the form of woven glass fibers. The backing member **27** may, if desired, take the form of an endless loop such as the conveyor belt **19**.

A plurality of transversely spaced strips **28** are connected to the backing member **27** in side-by-side alignment, each of the strips **28** preferably taking the form of a flexible material, for example, a woven fabric or a belt made of woven glass fibers.

A plurality of longitudinally spaced apart spike means **29** are connected to each of the strips **28** and project therefrom to engage the material to be conveyed.

Since the spike means **29** are attached to the longitudinally extending transversely spaced strips **28**, the force created by the tearing action of the fibers between the spike means **29** and other relatively rotating elements such as the comb **17** illustrated in the structure of Figure 1 will be considerably reduced with respect to the individual spike means **29** since only one spike on each strip will be engaged by a localized obstacle such as particularly heavy lumps of fibers.

It will be appreciated that this is a highly advantageous characteristic since the conveyor apron structures heretofore provided have employed a plurality of pins mounted on a single transversely extending support member such as a slat or a metal apron section and engagement of the pins by an obstacle in the fibers oftentimes produces a large force tending to distort or break the entire transversely extending support member.

According to the principles of the present invention, each of the spike means **29** is constructed to include a removable pin **30** mounted in an appropriately constructed pin retainer **31** which is, in turn, connected to one of the strips **28**.

In Figure 6 there is shown an enlarged view of one of the strips **28**, there being provided in the strip **28** a plurality of longitudinally spaced apertures **32** each adapted to receive one of the spike means **29**.

In Figure 7 there is shown an isometric view of the pin retainer **31**, and it will be noted that an upstanding boss **33** is formed thereon having a portion thereof indicated by the reference character **33***a* formed of a complemental configuration to that of the aperture **32** in the strip **28** to facilitate mating engagement therebetween. A bore **34** is provided in the retainer **31** to receive the pin **30** and is preferably acutely inclined relative to the reference plane established by the strip **28** so as to position the pin **30** in proper material engaging alignment.

Adjacent one end of the boss **33** is a pair of slots **36** provided to intersect the bore **34**. A snap ring **38** may be inserted in the slots **36** to engage an annular recess **37** formed in the pin **30** for locking the pin **30** in assembled relationship within the retainer **31**. It will be noted further that the pin **30** may be provided with an annular shoulder **39** engageable with the end of the boss **33**, the shoulder **39** lying in spaced relationship to the recess **37** for properly aligning the recess **37** relative to the slots **36** and for maintaining the pin **30** in the bore **34**.

In Figure 8 there is shown the provision of a rack **23** having a plurality of gear teeth **23***a* thereon and made of a suitable flexible material such as plastic so as to permit bonding of the rack **23** to one edge of the backing member **27**, thereby providing positive driving connection means for the conveyor belt.

It will be understood that the pin **30** and the retainer **31** may be conveniently fabricated as plastic moldings or may be made up of other materials such as aluminum and other non-sparking metals so that the entire belt assembly provided in accordance with the principles of the present invention eliminates fire hazards in textile equipment machinery by actually removing the cause of ignition of most mill fires.

Should the pins **30** engage a relatively rotating element of the textile equipment with which the conveyor belt is associated, the pins **30** will be knocked out individually but may be readily replaced through the mere insertion of a new pin in the bore **34** of the appropriate retainer **31** and locking same with a snap ring **38** or other suitable locking means. Moreover, it will be appreciated by those versed in the art that a single loose pin, particularly if made of a suitable non-sparking material, will do no appreciable harm in passing through other textile handling equipment if the pin is broken off of the conveyor belt and passed through with stock being treated.

Although various minor structural modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of this patent all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A spiked conveyor belt comprising a longitudinally extending sheet of backing material, a plurality of flat strips connected to said backing material in side by side marginal abutting relation and transversely aligned relative to one another and to said longitudinally extending sheet and a plurality of spaced apart spike carrying holders projecting out through each of said srtips.

2. A spiked conveyor apron comprising a plurality of flat strips transversely aligned side-by-side, spike carrying means projecting out through each of said strips, and means retaining said strips for longitudinal movement as an integral apron unit.

3. A conveyor belt comprising a sheet of backing material, said sheet having a longitudinal axis extending in the direction of movement of said belt, a plurality of flat strips connected to said backing, said strips being transversely aligned side-by-side relative to said longitudinal axis, and spike means carried by each of said strips and protruding outwardly from one face of said strips to engage material to be conveyed by said belt.

4. A spike conveyor belt comprising a sheet of flexible material formed as an endless loop and adapted to be rotated relative to a transverse reference axis, a plurality of flat strips of flexible material, each of said strips formed as an andless loop and connected to said sheet in abutting side-by-side transverse alignment, and spike means carried by each of said strips arranged to project outwardly of said closed loops.

5. A spiked conveyor belt comprising a flat flexible belt, a pin holder projecting therethrough, and having a bore open at one end, a removable pin-type spike inserted in said bore and having a portion projecting from the open end of said bore, and means to lock said spike in said pin holder.

6. A spiked conveyor belt comprising a flat flexible belt having a pin holder projecting therethrough and having a bore open at one end and being angularly inclined relative to the adjacent face of said belt, a removable pin inserted in said bore and having a spiked portion projecting outwardly of the open end of said bore at the same angle of inclination as said bore, and means to lock said pin in said bore.

7. A spiked conveyor belt comprising flexible belt means having a plurality of apertures arranged in predetermined spaced array, a corresponding plurality of pin holders, there being one pin holder received in each aperture, the apertures of said belt means and said pin holders each having complementary shaped configurations to securely retain said pin holders in assembly with said

belt means, an upstanding boss on each of said pin holders protruding from one face of the belt means, and a pin carried by said boss adapted to engage materials to be conveyed.

8. A spiked conveyor belt comprising flexible belt means having a plurality of apertures arranged in predetermined spaced array, a corresponding plurality of pin holders, there being one pin holder received in each aperture, the apertures of said belt means and said pin holders each having complementary shaped configurations to securely retain said pin holders in assembly with said belt means, a removable pin carried by each of said pin holders and protruding from one face of said flexible belt means to engage materials to be conveyed, and means to retain said pin in said pin holder.

9. In a spiked conveyor belt, a pin retainer comprising an upstanding boss having a bore formed therein open at one end, a removable pin inserted in said bore, a recess in said boss intersecting said bore, a recess in said pin adapted to lie in registry with said recess in said boss, and a snap ring seated in both of said recesses to lock said pin in said bore.

10. A non-sparking spiked conveyor belt comprising a sheet of flexible material forming a backing member for the belt, a plurality of transversely spaced flat strips connected to said backing member in side by side abutting relation, each of said strips being made of a flexible material and a plurality of pins carried by said strips and projecting outwardly from one face of said strips, each of said pins as well as said flexible strips comprising a hard non-sparking material.

11. A non-sparking spiked conveyor belt comprising a sheet of flexible material forming a backing member for the belt, a plurality of transversely spaced flat strips connected to said backing member, each of said strips being made of a flexible material, a plurality of pin retainers carried by each of said strips, each of said retainers comprising a hard non-sparking material forming a bore open at one end, a pin made of hard non-sparking material removably inserted into said bore and having a portion projecting from the open end of said bore to engage material to be conveyed, and means to lock said pin in said bore.

12. A non-sparking spiked conveyor belt as defined in claim 11, said bore lying on a predetermined inclined alignment relative to said strips to position said pin in predetermined material engaging alignment.

13. A non-sparking spiked conveyor belt as defined in claim 12 and a laterally extending rack made of flexible plastic material connected to one side of said belt and adapted to provide a positive driving connection for the belt.

14. In a spiked conveyor belt, a pin retainer comprising an upstanding boss having a bore formed therein open at one end, a removable pin inserted in said bore, a recess in said boss intersecting said bore, a recess in said pin adapted to lie in registry with said recess in said boss, and a retainer seated in both of said recesses to lock said pin in said bore.

15. In a spiked conveyor belt, a flexible backing member, a plurality of flexible strips connected to said backing member in side by side alignment, each of said strips carrying a plurality of pin retainers, each pin retainer comprising an upstanding boss having a bore formed therein open at one end, a removable pin inserted in said bore, a recess in said boss intersecting said bore, a recess in said pin adapted to lie in registry with said recess in said boss, and a snap ring seated in both of said recesses to lock said pin in said bore.

16. In a spiked conveyor belt, as defined in claim 15, said bore being angularly inclined relative to said strips and positioning the corresponding pin relative to the strips at the same angle of inclination as said bore.

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