Feb. 17, 1959 E. J. RENNER 2,873,501

TUBULAR CONVEYOR BELT

Filed Dec. 31, 1954

Fig. 1.

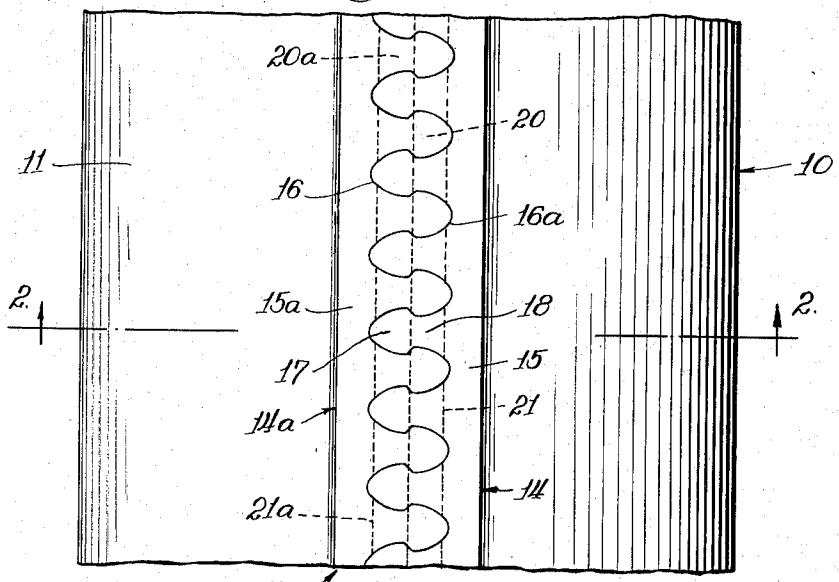



Fig. 2.

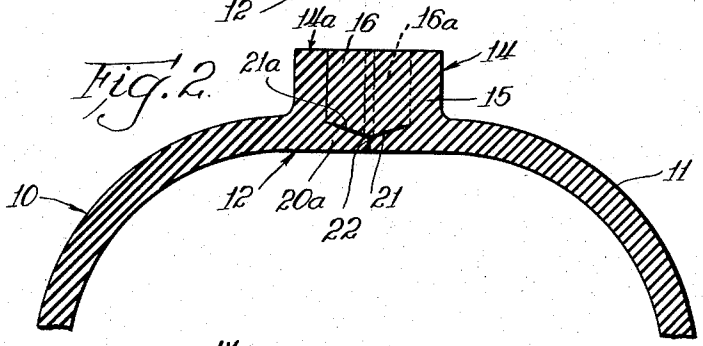



Fig. 3.

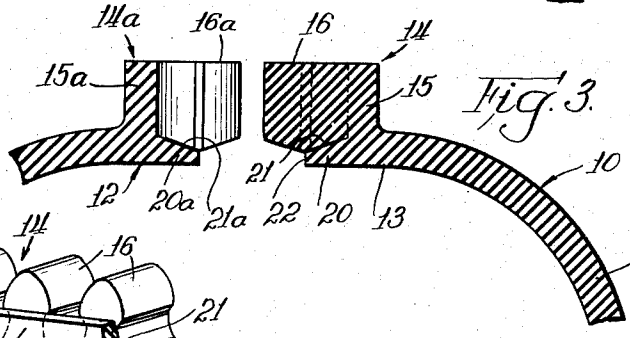
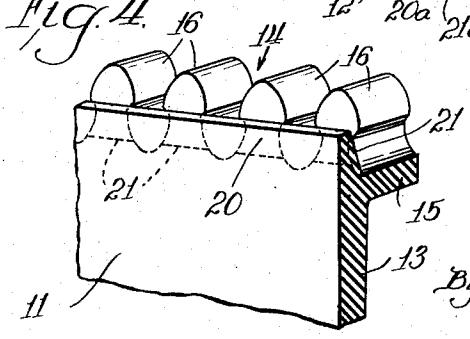



Fig. 4.

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2,873,501

# TUBULAR CONVEYOR BELT

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Application December 31, 1954, Serial No. 479,163

2 Claims. (Cl. 24—204)

This invention relates to a device for locking two members together and forming a seal at the line along which the members are locked.

This invention constitutes an improvement over the locking and sealing device employed to close a movable tubular conveyor belt of the general type shown in U. S. Letters Patent No. 2,365,762 issued December 26, 1944, to H. S. Johns et al., and U. S. Letters Patent No. 2,548,111 issued April 10, 1951, to H. S. Johns et al.

*Disadvantages of prior art.*—In interlocking and sealing devices of this general type, fastening means are mounted on flexible, resilient strips which are in turn attached to the members to be locked together. The flexible strips are adapted to be bent in such a way that the fastening means on at least one of the members can be spread into condition for sliding into a position of engagement with the opposing fastening means on the other member. After the interlocking means are in engagement, the bent strip is returned to its original condition. In that condition the two fastening means are interlocked with each other.

To provide a seal in conjunction with the interlocking device, a sealing web is mounted on each member near the fastening means. The teeth and sealing web are of integral construction, usually rubber. The result is an arrangement of an interlocking tooth, a sealing web extending across the space between that tooth and the next one, another interlocking tooth, a sealing web again extending across the space between adajcent teeth, etc. In a common form of this type of device, when the teeth carried by the two members are interlocked, the two sealing webs are pressed together in abutting relationship to form the desired seal.

When such an arrangement is bent to spread one set of interlocking teeth for engagement with the other set of teeth, this spreading action produces a stretching in the sealing web which fills the space between teeth. If the bending of the set of interlocking teeth is required to be relatively sharp, the resulting strain in the flexible sealing web may be quite great. It has been found that continued use of this type of interlocking means and sealing web often causes splitting or other damage at one or more points in the sealing web between pairs of adjacent teeth. Once the sealing web fails at a single point, the usefulness of the locking and sealing device may be lost for the entire apparatus.

*Invention summarized.*—In the locking and sealing device of this invention, the sealing web is free of its associated interlocking means for at least a portion of the web's width. Thus, when the sealing web is stretched to accommodate the bending of the interlocking means preparatory to engagement with the opposing interlocking means, the individual interlocking projections and the sealing web are stretched independently of each other.

*Advantages of this invention.*—The result is that the stretching stress is not confined solely to that part of the sealing web which extends across the space between adjacent teeth. The stretching occurs not only in this portion



of the sealing web but also in the portion which coincides with the area in which the teeth are located. With interlocking teeth of substantially identical size attached to both members to be locked together, the length of the sealing web which is stretched is at least doubled for any given portion of the web.

The necessary slit between the interlocking teeth and the sealing web can be produced very economically. In addition, this invention increases the life of the locking and sealing means very substantially; in those cases in which the rest of the apparatus and the locking and sealing device are integrally constructed, this automatically increases the life of the entire apparatus.

*Drawings.*—This invention will be described by reference to the accompanying drawings. In the drawings:

Figure 1 is a plan view of one embodiment of the locking and sealing device of this invention;

Figure 2 is a fragmentary sectional view taken along line **2—2** of Figure 1;

Figure 3 is an exploded view of the same structure shown in Figure 2; and

Figure 4 is a fragmentary perspective view of one half of the embodiment of Figure 1.

*Interlocking means.*—The locking and sealing device shown in Figure 1 is adapted for use in closing a movable tubular conveyor belt of the general type shown in the above mentioned Johns et al. Patents Nos. 2,365,762 and 2,548,111.

Movable conveyor belt **10** includes flexible tube **11** and locking and sealing device **12**. As best seen in Figures 2 and 3, the side walls of tube **11** terminate at their outer edges **13** in interlocking means **14** and **14***a*.

Interlocking means **14** includes a flexible shoulder or strip **15** carrying a row of teeth **16** which are spaced from each other and project from the shoulder. Likewise, interlocking means **14***a* includes flexible shoulder **15***a* from which teeth **16***a* protrude. In the embodiment shown, teeth **16** and **16***a* are of substantially identical shape.

Each tooth **16** on interlocking means **14** is positioned opposite the space between an opposing pair of teeth **16***a* projecting from complementary interlocking means **14***a*. The width of each tooth **16** is greater near its crown **17** than at a point **18** nearer its base, and is also greater than the narrowest portion of the space defined by the opposing pair of teeth **16***a* so long as flexible shoulder **15***a* remains straight. It follows that when teeth **16** are inserted between opposing pairs of teeth **16***a*, they cannot slide out again unless shoulder **15***a* is bent to spread teeth **16***a* apart to free the wide crown portion of tooth **16**. In other words, interlocking means **14** and complementary interlocking means **14***a* remain locked firmly together whenever their corresponding teeth are in the position shown in Figures 1 and 2, with flexible strips **15** and **15***a* straight.

Teeth **16***a* are in all respects the same as teeth **16** except that they project from outer edge **13** of the opposing side wall of tube **11**. It is further seen from Figure 1 that teeth **16** and **16***a* are of such shape and location that each tooth substantially fills the space between the opposing pair of teeth.

As stated, interlocking means **14** and **14***a* are shown in their locked position in Figures 1 and 2. By reason of the construction just described, the interlocking means are adapted to be disengaged by pressure from guide wheels (not shown) inside tube **11** which bend flexible shoulders **15** and **15***a* so as to spread the interlocking means. They are also adapted to be pressed back into engagement and locked position by pressure exerted upon shoulders **15** and **15***a* from the outside towards the opposing interlocking means by other guide wheels (not shown).

*Sealing web.*—The fact that teeth **16** and **16***a* fit snugly against each other provides not only a locking device but also, to an extent, a seal against leakage from the movable tubular conveyor belt or other container which is closed by this device. However, a still more reliable seal may be produced by use of sealing webs **20** and **20***a*, one attached to each outer edge **13** of tube **11**.

The sealing webs are shown in dotted lines in Figure 1 and in solid lines in the sectional views given in Figures 2 and 3. As one moves longitudinally along the outside of interlocking means **14**, one finds a tooth **16**, sealing web **20**, another tooth **16**, sealing web **20**, etc. From the interior of tube **11**, one sees a continuous web **20** which extends along the entire length of outer edge **13** of the conveyor belt just inside interlocking means **14**. This arrangement of parts may perhaps be best seen in the fragmentary perspective view of Figure 4.

A similar sealing web **20***a* is attached in the same fashion to the other side wall of tube **11** near interlocking means **14***a*. When teeth **16** and **16***a* are engaged in their locked position, sealing webs **20** and **20***a* on opposing outer edges **13** are pressed together in abutting relationship to form a seal that is proof against pressure tending to force material out of the conveyor belt.

For structural strength and convenience of fabrication, sealing web **20** is integrally formed with teeth **16** of interlocking means **14**. The same is true of the analogous parts on the opposing outer edge **13**. As best shown in Figures 2 through 4, the entire locking and sealing device mounted on each outer edge **13**, including both the interlocking means and sealing web, may constitute an integral extension of the side wall of tube **11**, fabricated of the same flexible material such as rubber.

*Independent operation of teeth and web in this invention.*—As explained above, when it is desired to open the tubular conveyor belt, teeth **16** and **16***a* are disengaged by bending shoulders **15** and **15***a* to spread each pair of teeth so that the opposing tooth locked between the pair may slide out. When it is desired to lock the two walls of the tube together again, the same spreading action must be effected to permit each tooth to slide into the opposing space in the interlocking means carried by the other edge of the tube wall.

From Figures 1 and 4, and the above description, it is seen that whenever teeth **16** are spread apart by bending flexible shoulder **15**, it is also necessary to stretch sealing web **20**. The same is true for sealing web **20***a*, associated with the other interlocking means **14***a*

In the present invention, the stretching stress imposed upon sealing web **20** is drastically reduced by providing a slit **21** extending a substantial distance into the material connecting the sealing web and each tooth **16** with which it is integrally formed.

As best seen in Figures 2 through 4, slit **21** extends back from the outer edge **22** of sealing web **20** approximately to the base of tooth **16**. Slit **21** is seen in dotted line in Figures 1 and 4.

Teeth **16***a* and sealing web **20***a* are separated by a corresponding slit **21***a*, also shown in dotted line in Figure 1.

The bending of flexible shoulders **15** and **15***a* required to disengage and re-engage interlocking means **14** and **14***a* can best be visualized from examination of Figures 1 and 4. If slits **21** and **21***a* were not provided as described, it is seen that bending the two interlocking means for engagement or disengagement would apply a stretching stress to sealing webs **20** and **20***a* solely at the locations of those webs between teeth **16** and **16***a*, respectively.

However, with slits **21** and **21***a*, the bending stress is distributed along the entire length of the sealing webs. This produces markedly less wear in the sealing webs and thereby greatly increases the useful life of this locking and sealing device.



The above detailed description of this invention is provided for clearness of understanding only. No unnecessary limitations are to be understood therefrom as modifications will be obvious to those skilled in the art.

I claim:

1. A tubular conveyor belt for conveying bulk materials comprising an endless flexible tube formed at least in part by longitudinally extending side walls terminating in edges that are adapted to be positioned in juxtaposed relation, said side walls being formed with zipper-like interlocking teeth along said edges, whereby when said teeth are interlocked, said tube is formed, said side walls also each being formed with an endless and imperforate sealing web projecting away from the side wall along said edges thereof, said webs of each side wall extending parallel to the plane of said teeth of the side wall, said webs being proportioned to abut each other, when said teeth are interlocked, to form a seal against leakage from the conveyor, said teeth and said web of each side wall being integrally formed with the side wall, and being positioned closely adjacent each other, said web of each side wall being disconnected from each tooth of the side wall by a slit formed in the side wall between the respective teeth and the web, whereby, when said side walls are flexed to spread said teeth of each side wall to lock and unlock same, the tension forces created in said web are uniformly distributed along the lengths of said webs.

2. A tubular conveyor belt for conveying bulk materials comprising an endless flexible tube formed at least in part by longitudinally extending side walls formed with smooth internal surfaces and terminating in edges that are adapted to be positioned in juxtaposed relation, said edges each being formed with a shoulder that extends longitudinally of the edge and projects laterally outwardly of the internal surface of the side wall on which the shoulder is formed, said shoulders being formed with zipper-like interlocking teeth, said teeth being in rows that extend generally parallel to the respective side walls, whereby, when said teeth are interlocked, said tube is formed, said edges also each being formed with a sealing web that extends along the inner sides of the teeth of the respective edges, said webs being proportioned to abut each other, when said teeth of said edges are interlocked, to form a seal against leakage of the conveyor, said teeth and said web of each side wall being integrally formed with the side wall, said web of each side wall being separated from the inner sides of each tooth of the side wall by at least a relatively narrow opening between the webs and the respective teeth, whereby, when said side walls are flexed to spread said teeth of each side wall to lock and unlock same, the tension forces created in said web are uniformly distributed along the lengths of said webs.


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