# VACUUM CONVEYOR APPARATUS

## Field

The present invention relates to vacuum conveyor apparatuses, e.g., vacuum conveyor belt devices.

## Background

Vacuum conveyor belts are widely used for conveying sheets, components, parts, and other work pieces from one place to another in various handling and manufacturing operations. In some cases, the work piece may be operated on, e.g., polished, modified by removal of select portion(s) or addition of supplemental components, etc., while secured to the vacuum conveyor belt.

In order to ensure that articles being conveyed or operated on while secured to the belt, a sufficiently strong vacuum pressure to achieve secure position is typically used. In the course of manipulation of the articles as they are seated on the belt, e.g., positioned in proximity to the belt and subjected to vacuum applied to temporarily position them thereon, conveyed and perhaps operated on while on the belt, and then unseated from the belt, the article may be subjected to shifting of position relative to the surface belt. Such shifting of position may tend to result in damage to the article, particularly in the case of fragile articles, e.g., smooth surfaced optical parts, etc.

The need exists for improved vacuum belts.

## Summary

~~The~~ Embodiments of the present invention seek to provide~~s~~ improved vacuum belts and methods for using such belts.

In brief summary, a conveying apparatus according to an aspect of the invention comprises: (1) a conveyor belt comprising a load bearing belt having an exterior surface and an interior surface, the belt having a plurality of channels therethrough, (2) mounting material on the exterior surface of the belt, and (3) a resilient~~,permeable~~ engagement covering. When operated in conjunction with means for imparting a negative pressure to the interior surface of the belt, a suction draw is impart through the belt so as to hold workpieces thereon.

Briefly summarizing, the method of the invention according to an aspect comprises: (1) providing a conveying apparatus of as described herein; (2) providing at least one workpiece; and (3) imparting a negative pressure to the interior surface of the conveyor belt so as to generate a suction draw through the channels; then, in order, (4) positioning the at least one workpiece in proximity to the conveying apparatus such that the suction draw causes the workpiece to seat against the conveying apparatus compressing the resilient engagement covering; (5) conveying the workpiece; and then (6) removing the workpiece from the conveying apparatus.

CLAIMS:

1. A conveying apparatus comprising: (1) a conveyor belt comprising a load bearing belt having an exterior surface and an interior surface, the belt having a plurality of channels therethrough, (2) mounting material on the exterior surface of the belt, and (3) a resilient engagement covering.

2. The apparatus of claim 1 wherein the mounting material is a ~~hooked~~ fastener with protruding hooks engaged with the resilient engagement covering.

3. The apparatus of claim 1 wherein the mounting material is bonded to the exterior surface of the belt with adhesive.

4. The apparatus of claim 1 wherein the resilient engagement covering is a knit fabric comprising a base layer having first and second faces and a resilient looped pile protruding from the first face.

5. The apparatus of claim 4 wherein the base layer comprises a woven base layer, a knitted base layer, a non-woven base layer, or a combination thereof.

6. The apparatus of claim 4 wherein the resilient looped pile comprises a fibrous material selected from poly(tetrafluoroethylene), aramid, polyester, polypropylene, polyethylene, nylon, wool, bamboo, cotton, or a combination thereof.

~~7. The apparatus of claim 1 further comprising a hooked fastener disposed adjacent to at least one end of the outer surface of the roller, thereby attaching the static reduction engagement cover to the roller.~~

~~8~~7. The apparatus of claim 1 wherein the resilient looped pile fabric comprises a fiber having a size ranging from about 35 denier to about 400 denier.

~~9~~8. The apparatus of claim 1 wherein the resilient looped pile fabric comprises loops having a height from about 0.25 mm to about 5 mm.

~~10~~9. The apparatus of claim 1 further comprising means for imparting a negative pressure to the interior surface of the belt.

~~11~~10. A method for conveying a workpiece comprising: (1) providing a conveying apparatus of claim 1; (2) providing at least one workpiece; and (3) imparting a negative pressure to the interior surface of the conveyor belt so as to generate a suction draw through the channels; then, in order, (4) positioning the at least one workpiece in proximity to the conveying apparatus such that the suction draw causes the

workpiece to seat against the conveying apparatus compressing the resilient engagement covering; (5) conveying the workpiece; and then (6) removing the workpiece from the conveying apparatus.

~~12~~11. The method of claim ~~11~~10 further comprising modifying the workpiece between the steps of (4) positioning and (6) removing.