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ABRASIVE BELT MECHANISM

Filed Oct. 21, 1965

2 Sheets-Sheet 1

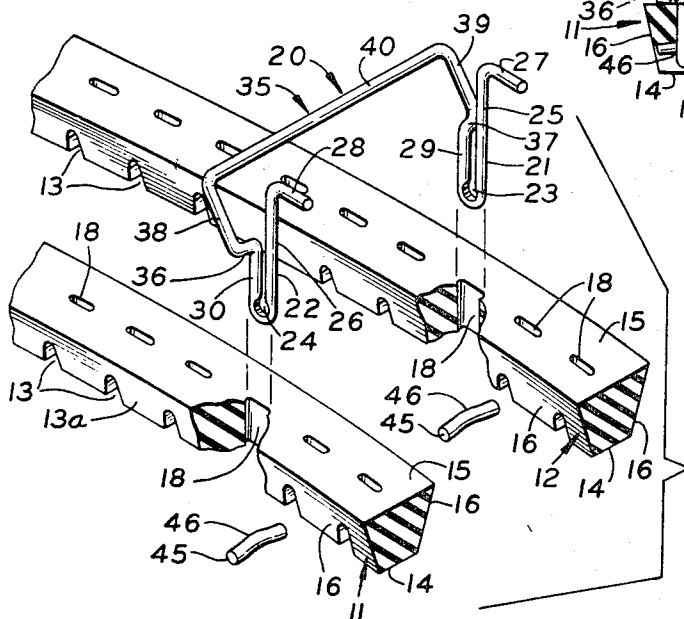
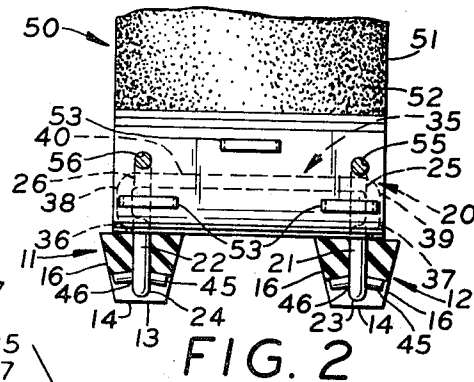
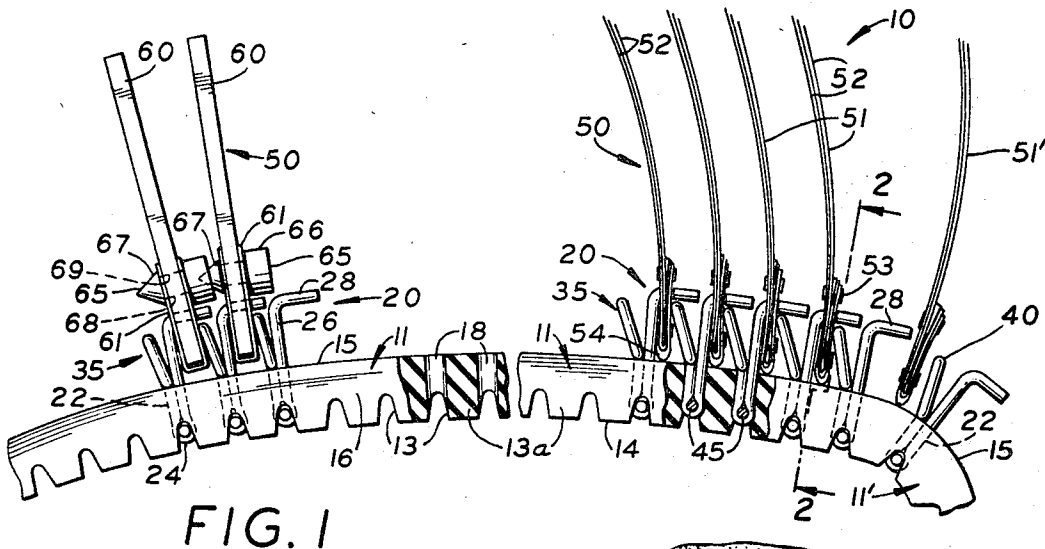


FIG. 3

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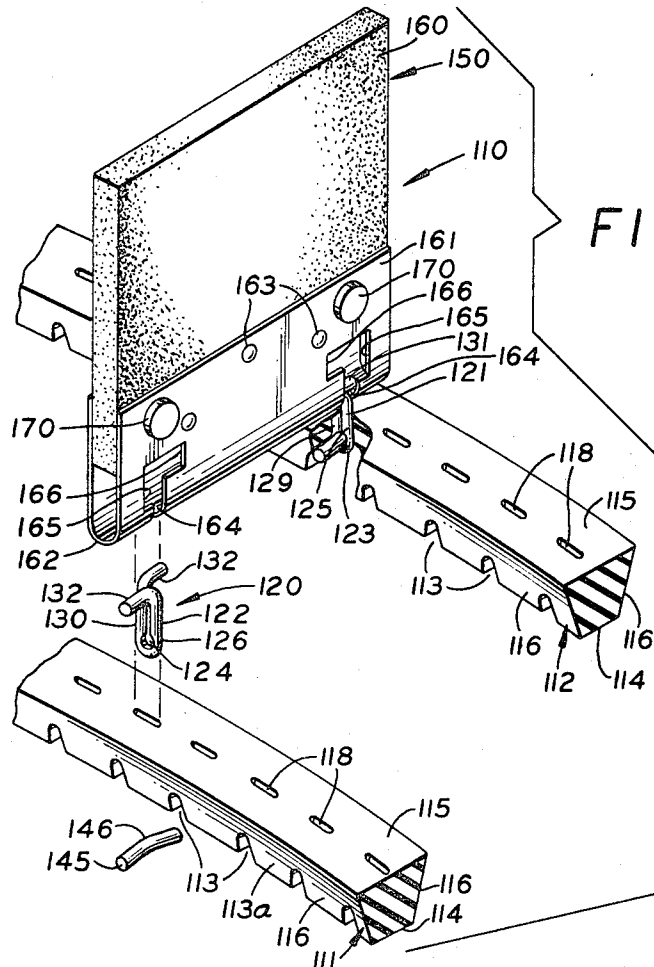


FIG. 4

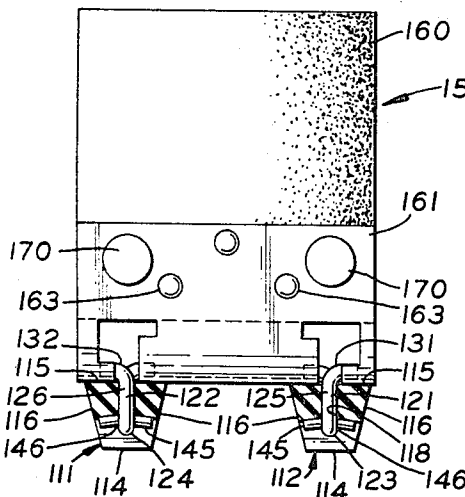


FIG. 5

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ABSTRACT OF THE DISCLOSURE

A plurality of flexible conveyor belts with outwardly projecting carrier elements attached to a plurality of said belts at spaced longitudinal intervals and either solid or flexible abrasive elements selectively removably attached to the carrier elements by forming the belts about an arc of relatively short radius and projecting outwardly of the belts and carrier elements when installed to provide a succession of abrasive surfaces.

The present invention relates generally to surface finishing apparatus. More particularly, the invention relates to a belt conveyancer mounting carriers for attaching abrasive elements. Specifically, the invention relates to a belt conveyor having one or more belts with spaced carriers mounting abrasive elements projecting outwardly therefrom.

Abrasive machining apparatus has characteristically consisted of thin surfaces of bonded abrasive material mounted on a disc or an endless conveyor. These devices are commonly subject to a number of operational defects or deficiencies which have limited their expanded use. The primary improvements which have developed in abrasive belt mechanisms in recent years have been in the areas of providing wider belts to handle wider materials or a plurality of narrow materials and the inclusion of multiple stations to make a plurality of cuts in a single pass of the workpiece through the mechanism.

However, these endless conveyor mechanisms are still subject to the long standing problem that a premature defect in a flat abrasive belt caused by a flaw in the manufacture of the belt or in the workpiece can be remedied only by replacing the abrasive belt in its entirety. This accepted replacement process has proven to be both time consuming and expensive.

Some developments have suggested the removable attachment of abrasive pieces to belts or wheels for certain specific applications. However, the means of attachment which have been employed to carry the abrasive pieces have largely proven to be problematical in that the holding means have a tendency to fail, and the attachment and detachment of the abrasive pieces require considerable time and effort. Further, these known means of attachment are adapted particularly for use with conventional flat belts and would be inapplicable or otherwise not suitable for use with the advantageous V-belts which are now commonly employed.

Accordingly, a principal object of the present invention is to provide an improved abrasive belt mechanism employing a standard V-belt drive.

Another object of the invention is to provide improved carrier clip means which will selectively position abrasive elements outwardly of a V-belt along the length thereof.

A further object of the invention is to provide improved carrier clip means which can be readily attached to or detached from a V-belt.

An additional object of the invention is to provide improved carrier clip means to which abrasive elements may be fastened without the necessity of detaching the carrier or clip means from the V-belt.

Still another object of the invention is to provide improved carrier clip means adapted to removably retain

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pads or packs of flexible abrasive material or rigid abrasive blocks or pieces.

An additional object of the invention is to provide improved carrier clip means particularly adapted to removably retain rigid abrasive blocks or pieces.

A further object of the invention is to provide an improved abrasive belt mechanism wherein the abrasive elements are positioned substantially perpendicular to the belt and are mutually supporting.

Various other objects and advantages will appear from the following description taken in conjunction with the attached drawings, and the novel features will be particularly pointed out hereinafter in conjunction with the appended claims.

In the drawings:

FIG. 1 is a side elevation of an abrasive belt mechanism according to the present invention showing portions of an endless belt mounting packs of flexible abrasive material and solid abrasive blocks and showing a portion of the belt bent over a small radius in the loading position for attaching or detaching abrasive elements.

FIG. 2 is a fragmentary front elevation taken substantially on line 2—2 of FIG. 1 detailing the mounting of packs of flexible abrasive material.

FIG. 3 is an exploded perspective view of a portion of the abrasive belt mechanism of FIGS. 1 and 2 showing the attachment of the carrier clip means to the V-belts.

FIG. 4 is an exploded perspective view of an additional embodiment of the invention particularly adapted for the mounting of solid abrasive blocks.

FIG. 5 is a front elevation of the alternate embodiment of the invention of FIG. 4 in its assembled form.

An abrasive belt mechanism according to the present invention employs a plurality of continuous conveyor belts to which outwardly projecting carrier means are attached at spaced intervals along the length thereof. The carrier means or clips have selectively removably mounted or attached abrasive elements. The abrasive elements project outwardly of the conveyor belt beyond the carrier means or clips to provide a somewhat flexible abrasive surface due to the conveyor belt mounting.

The abrasive belt mechanism, generally indicated by the numeral 10 in FIG. 1, is part of an endless conveyancer device which is adapted to be reeved about a standard configuration of pulleys (not shown) having driving and driven members. If desired, the mechanism may be employed in conjunction with idler pulleys to achieve desired positioning or guide pulleys to maintain alignment in cases where the pulley shafts are inclined with respect to each other.

The abrasive belt mechanism 10 employs a pair of continuous V-belts 11 and 12 which may be of standard construction and cross section with suitable minor modification hereinafter described. The characterizing feature of a V-belt is its trapezoidal cross section which is adapted to seat or ride in V-shaped pulley grooves. The V-belts 11, 12 may be formed of commonly employed cord and fabric, impregnated with rubber, the cord material being cotton, rayon, synthetic, or steel depending on the dictates of the particular system. For the purposes of the present invention, the V-belts have transverse grooves 13 forming spaced cogs 13a in the surface of the inner shorter parallel side 14. Although the grooves 13 may be cut in a conventional V-belt, it is preferable to employ standard belts of this design, which are readily available, to avoid possible damage to the internal cord structure which would cause a change in the strength characteristics.

Referring now to FIGS. 1—3, the V-belts 11, 12 have in addition to the inner, shorter parallel side 14, a longer outer parallel side 15 which ideally rides substantially flush with the outer extremity of the V-shaped groove of

a pulley. The parallel sides of the V-belts 11, 12 are joined by identical non-parallel sides 16, which are adapted to frictionally matingly engage the sides of a V-shaped pulley groove. The V-belts 11, 12 are modified only to the extent that they are provided with oblong, preferably longitudinal bores 18 which extend from the outer parallel side 15 centrally downwardly to communicate with the medial portion of the grooves 13 separating the cogs 13a.

The V-belts 11, 12 retain and semi-rigidly support abrasive mounting means or carrier elements generally indicated by the numeral 20. The carrier elements 20 are preferably in the form of a hook or clip adapted to matingly engage more than one V-belt. As shown, the carrier elements 20 have projecting stirrup portions 21 and 22 which terminate in eyes 23 and 24 at one extremity. At the opposite extremities of stirrups 21, 22 are first extending shanks 25 and 26 which angle into projecting arms or hangers 27 and 28 which are preferably substantially parallel and serve a purpose to be hereinafter described in detail. Also at the opposite extremities of stirrups 21, 22 are second extending shanks 29 and 30 which are joined by a C-shaped spacer, generally indicated by the numeral 35. The spacer 35 is preferably formed integrally with shanks 29, 30 of stirrups 21, 22 and has lateral offsets 36 and 37, displacement arms 38 and 39 inclined with respect to shanks 29, 30 and a support bar 40 extending between the displacement arms 38, 39. The carrier elements 20 are constructed of a metallic wire, rubber, or plastic material having suitable rigidity and forming characteristics.

The carrier elements 20 are selectively attached to belts 11, 12 by inserting the stirrups 21, 22 into the oblong bores 18 spaced longitudinally of the outer parallel side 15. To achieve optimum ease of insertion and removal of stirrups 21, 22 yet maintain the shanks 25, 26, 29, 30 substantially perpendicular to outer parallel side 15, the oblong bores 18 are preferably slightly larger than the combined size of the two shanks of each stirrup. As best seen in FIG. 1, the length of shanks 29, 30 is such that when the lateral offsets 36, 37 of spacer bar 35 are in contact with the outer parallel sides 15 of belts 11 and 12, the eyes 23, 24 of stirrups 21, 22 project slightly into the grooves 13 formed between the cogs 13a of belts 11, 12.

Retaining or lock pins 45 are roved or inserted in each of the eyes 23, 24 to anchor the carriers 20 firmly in place on the belts 11, 12. The lock pins 45 are preferably formed of material having a circular cross section and being substantially linear, except for an intermediate bend or indentation 46 which seats in eyes 23, 24 of stirrups 21, 22. The lock pins 45 are maintained in position during operational use of the mechanism 10 due to the indentation 46 and the frictional contact between the lock pins 45 and the grooves 13 of the belts. However, the lock pins 45 may be readily removed by forcing the stirrups 21, 22 as far through the belts 11, 12 as possible and applying an axial force to the ends of the lock pins 45. The pins 45 may be constructed of any metal, plastic, or any other suitable material having reasonably good sheer and bending resistance.

Each of the carrier elements 20 selectively removably mount an abrasive means or element, generally indicated by the numeral 50, which is conveyed along a predetermined path by virtue of its attachment to the V-belts 11, 12. The abrasive elements 50 may consist of a rigid block of abrasive material or an abrasive material bonded to a flexible paper or fibrous backing. The right side elements of FIG. 1 and FIG. 2 depict exemplary flexible abrasive pads or packs 51 having one or more sheets 52 consisting of an abrasive material bonded to a fibrous cloth or paper backing. In order to maintain the individual sheets 52 in fixed relation so that they constitute a unit, fastening means such as the staples 53 are employed. Other types of fasteners such as brads, bolts, or rivets may be employed equally well. To provide thicker and more rigid packs 51 for insertion of the staples 53, the sheets 52 may

be folded over as at 54 to provide a doubled or reinforced attachment area.

The abrasive elements 50 are attached to the carrier elements 20 by means of appropriate openings or holes 55 and 56 in the packs 51 which matingly engage the arms or hangers 27 and 28. As best seen in the right hand portion of FIG. 1, the packs 51 are maintained well back on the hangers 27, 28 near the shanks 25, 26 by the support bar 40 of an adjacent spacer 35 when the belts 11, 12 assume a configuration which is linear or conforms to an arc of a large circle, as when the belts 11, 12 are reeved about a standard pulley system. However, if the belt mechanism 10 is removed from a pulley system and the V-belts 11, 12 bent about an arc of short radius, as seen at 11' in the extreme right of FIG. 1, the adjacent support bar 40 pivots away from the carrier element 20 allowing clearance for the insertion or removal of an abrasive pack such as the one depicted at the position 51'. Thus, any one of the abrasive packs 51 may be readily selectively removed to replace worn or damaged abrasive sheets 52 or to substitute a different grade or texture of abrasive material.

The carrier elements 20 are also adapted to mount abrasive elements 50 consisting of rigid blocks 60 of abrasive material as depicted in the left portion of FIG. 1. The abrasive blocks 60 are preferably encased in U-shaped reinforcing sheaths 61 of sheet metal or similar material and otherwise mounted in a manner identical to the flexible abrasive packs 51. In arrangements where the spacing between the rigid blocks 60 is such that the outward extremities might come into contact and thereby result in chipping, cracking, or other damage, resilient buffers 65 may be provided to maintain proper spacing. As shown, the buffers 65 are somewhat bullet-shaped having a cylindrical body 66 and a conical head 67. A reduced diameter portion 68 of the body 66 may be provided medially thereof for retentive insertion through a hole 69 provided in the solid blocks 60 and the sheaths 61. The conical head 67 of each buffer 65 contacts the base of the cylindrical body 66 of its adjacent counterpart. The buffers 65 may be constructed of rubber or any similarly suitable resilient material. One buffer 65 may be provided for each abrasive block 60, substantially medially of the belts 11, 12, or two buffers 65 may be employed, one approximately aligned with each belt 11 and 12 as seen in FIGS. 4 and 5.

The abrasive belt mechanism 10 described above is extremely versatile and may be utilized in conjunction with flexible abrasive packs 51 or rigid abrasive blocks 60. However, for installations when rigid abrasive blocks are to be used exclusively, the simplified form of abrasive belt mechanism shown in FIGS. 4 and 5 and indicated generally by the numeral 110 is particularly advantageous in terms of simplicity and cost reduction, although it may be employed with flexible abrasive packs.

Referring specifically to FIGS. 4 and 5, the abrasive belt mechanism 110 employs a pair of V-belts 111 and 112 for operation in a pulley drive which are preferably substantially identical with the V-belts 11, 12, as described above. V-belts 111 and 112 have a shorter parallel side 114, a longer parallel side 115, and joining identical non-parallel sides 116. Shorter parallel sides 114 have transverse grooves 113 forming spaced cogs 113a with oblong bores 118 extending from the grooves to the longer parallel sides 115.

The carrier elements 120 are attached to the belts 111, 112 in the same manner as the carrier elements 20; however, they are structurally otherwise different, although achieving an identical function. The belt attachment structure includes stirrup portions 121 and 122 having eyes 123 and 124 at one extremity thereof. Shanks 125 and 129 of stirrup 121 and shanks 126 and 130 of stirrup 122 terminate upwardly in short laterally projecting hangers 131 and 132, respectively. The carrier elements 120 are anchored or attached to the V-belts 111, 112 by

retaining or lock pins **145** having a medial bend or indentation **146** which seats in the eyes **123**, **124** of stirrups **121**, **122**.

The abrasive belt mechanism **110** is adapted to mount abrasive elements **150** which are rigid abrasive blocks **160**, similar to the rigid blocks **60** described above. However, the abrasive blocks **160** are mounted in the reinforcing sheaths **161** in a different manner to provide a unique suspension for the hangers **131**, **132** of carrier elements **120**. The abrasive blocks **160** are positioned in the U-shaped sheaths **161** a substantial distance from the base **162** and rigidly affixed by rivets or other suitable fastening means **163**. The sheaths **161** have curved slots **164** extending from the base **162** and progressively broadened on either side by notches or recesses **165** and **166**. When the abrasive belt mechanism **110** is operating on a pulley drive, the shanks **121**, **122**, **129**, **130** project through the slots **164** and the hangers **131**, **132** are restrictively encased within the base **162** of sheath **161**. If the belts **111**, **112** are removed from a pulley system and formed about an arc of short radius, the blocks **160** may be rotated toward the plane of the belts to pass the hangers **131**, **132** out the broadened recess **166** of slots **164** for replacement of the entire abrasive element **50**.

In a manner similar to that provided for the solid blocks **60**, resilient buffers **170** may be employed to maintain proper spacing between the abrasive elements **160**. The buffers **170** are preferably inserted through the sheath **161** and abrasive block **160**, and one or more buffers **170** may be used for each abrasive element **150** depending upon the width of the abrasive blocks **160** and other characteristics of the abrasive belt mechanism **110**.

It is evident that the abrasive elements **50** and **150** may be of any desired width by providing additional V-belts and carriers for support of the abrasive elements. Alternatively, in a multiple V-belt system of more than two belts, the abrasive elements **50**, **150** might be less than the full width and mounted or attached to different V-belts than the adjacent abrasive elements. A preferred form of the invention has been shown and described in sufficient detail to enable one skilled in the art to practice the invention. Since various modifications in details, materials, and arrangements of parts are within the spirit of the invention herein disclosed and described, the scope of the invention should be limited solely by the scope of the attached claims.

What is claimed is:

1. An abrasive belt mechanism comprising, a plurality of flexible conveyor belts, outwardly projecting carrier elements each removably attached to at least two of said belts at spaced longitudinal intervals, and abrasive elements selectively removably attached to said carrier elements by forming said belts about an arc of relatively short radius, said abrasive elements projecting outwardly of said conveyor belt beyond said carrier means to provide a succession of abrasive surfaces.

2. Apparatus according to claim **1** wherein said carrier elements have hangers insertable in openings in said abrasive elements.

3. Apparatus according to claim **1** comprising, said conveyor belts being V-belts having longitudinally spaced longitudinal bore and said carrier elements having stirrups insertable in said bores for selective placement along said conveyor belts.

4. Apparatus according to claim **3** comprising, said V-belts having grooves on their inner surfaces and having said bores terminate in said grooves and said stirrups being anchored to said V-belts by lock pins selectively insertable in said grooves.

5. Apparatus according to claim **4** comprising, said stirrups forming eyes and lock pins selectively inserted in said eyes when said stirrups are inserted in said bores.

6. Apparatus according to claim **1** comprising, said carrier elements having hangers selectively engaging said abrasive elements and having spacers positioning and supporting at least one adjacent abrasive element.

7. Apparatus according to claim **1** comprising said abrasive elements being flexible abrasive packs of one or more sheets of abrasive material.

8. Apparatus according to claim **1** comprising, said abrasive elements being solid blocks of abrasive material having a reinforcing sheath in the area of attachment to said carrier means.

9. Apparatus according to claim **8** comprising, said abrasive elements having resilient buffers for spacing and protecting adjacent abrasive elements.

10. Apparatus according to claim **6** comprising, said carrier elements having hangers selectively engaging said abrasive elements, whereby said abrasive elements are positioned substantially perpendicular to said belts at the point of attachment thereto.

11. An abrasive unit for attachment to a plurality of laterally spaced V-belts comprising, carrier elements having stirrups adapted to extend through and attach to said V-belts and abrasive elements spanning said stirrups and selectively removably attached to said carrier elements.

12. Apparatus according to claim **11** comprising, said stirrups forming eyes and lock pins selectively inserted in said eyes when said stirrups are extended through said V-belts for securement thereto.

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