United States Patent

[11] 3,586,156

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[45] Patented **June 22, 1971**

[54] **CONVEYOR AND TAPE THEREFOR**
27 Claims, 20 Drawing Figs.

[52] **U.S. Cl.** **198/201**
[51] **Int. Cl.** **B65g 15/40**
[50] **Field of Search** 198/184, 193, 191, 201, 204

[56] **References Cited**

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Primary Examiner—Harvey C. Hornsby
Assistant Examiner—Alfred N. Goodman
Attorney—Hyer, Eickenroht, Thompson & Turner

ABSTRACT: The conveyor disclosed includes rollers and an endless tape that encircles the rollers and is moved longitudinally by rotation of one of the rollers. The tape is preformed into a troughlike shape in cross section with at least two sections of the strip curved in opposite directions to provide a guide surface. Guide rollers engage the guide surface to support the tape and to hold it against lateral movement. The tape is made of material having sufficient resiliency to flatten, as required, when the tape changes its direction of travel, and thereafter to return to its preformed shape.

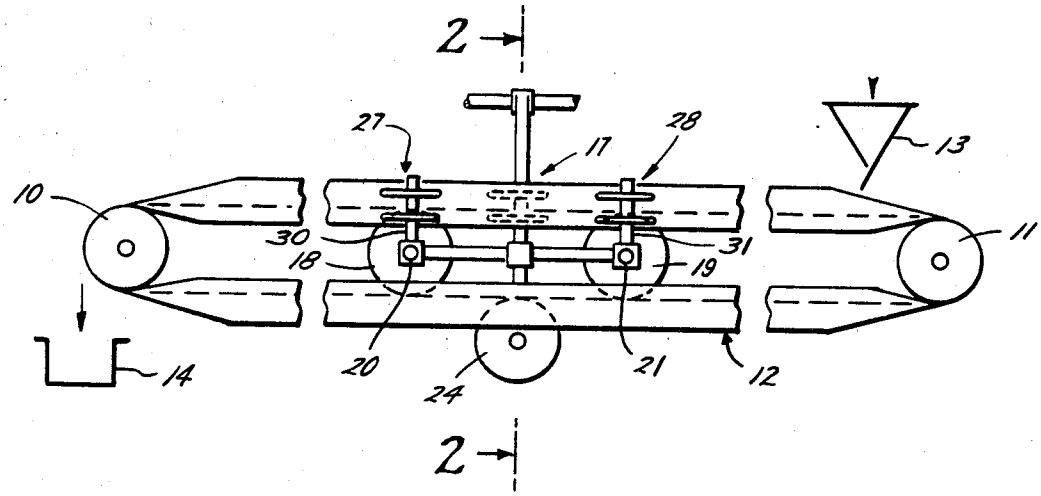

Fig. 1

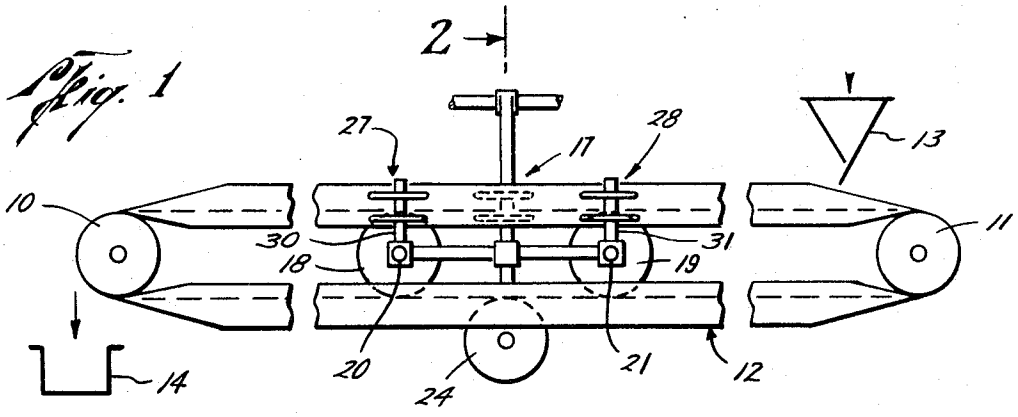

Fig. 3

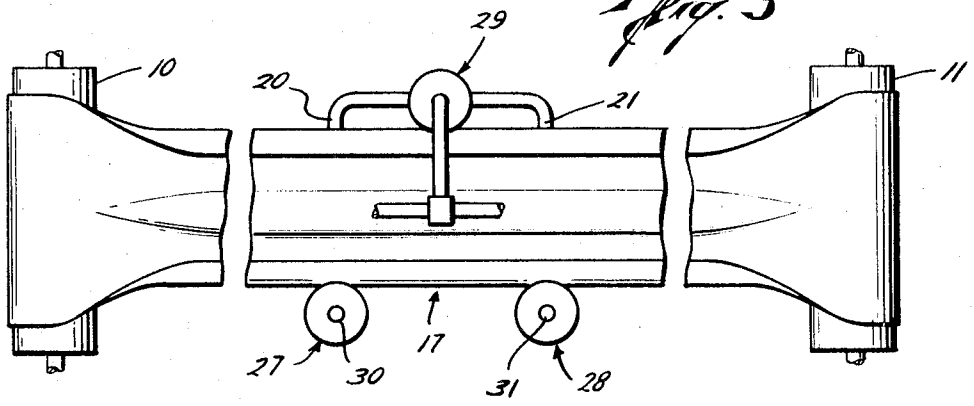

Fig. 2

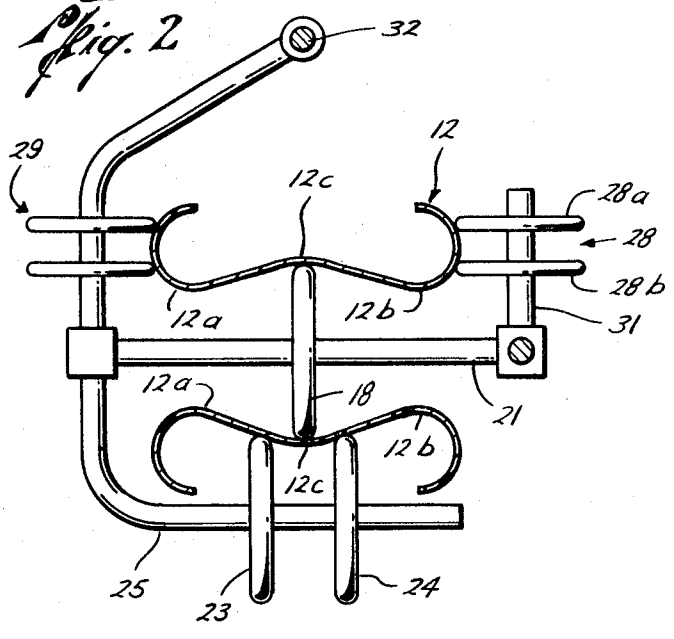

Fig. 2A

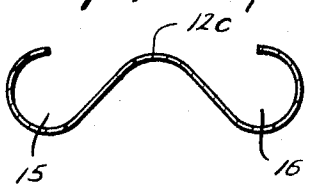

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Fig. 4

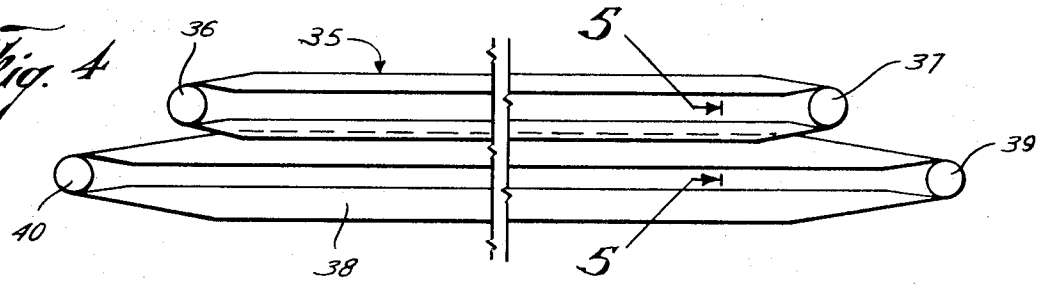

Fig. 5

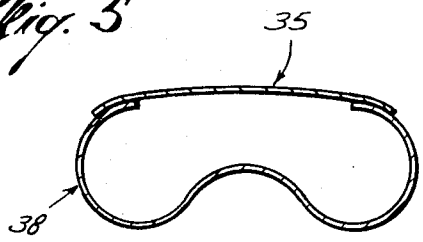

Fig. 6

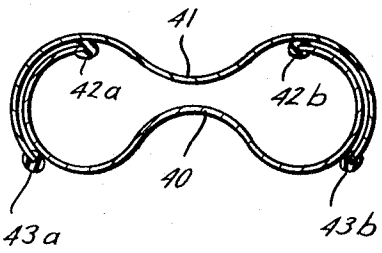

Fig. 7

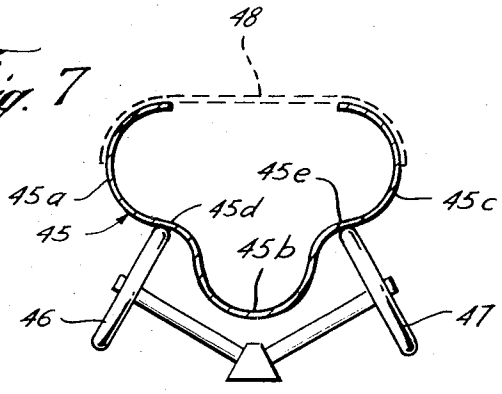

Fig. 8

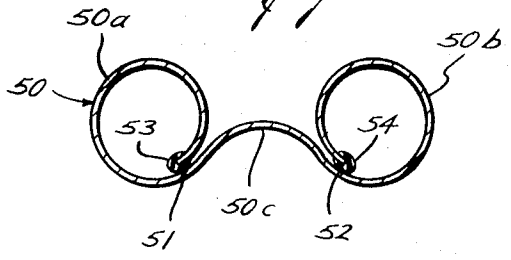

Fig. 9

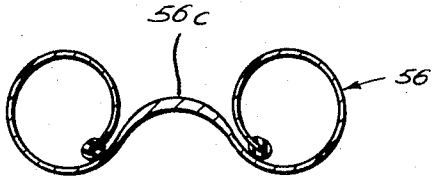

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Fig. 10

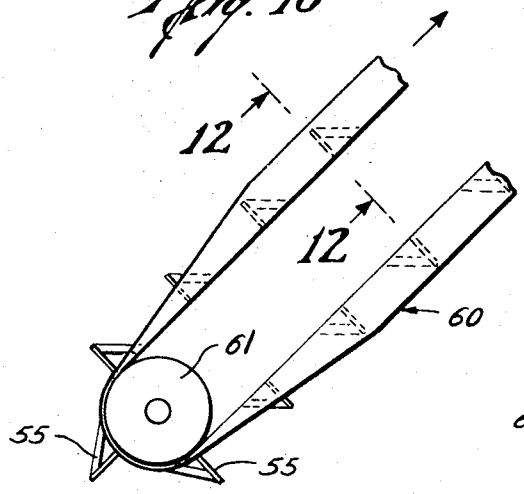


Fig. 11

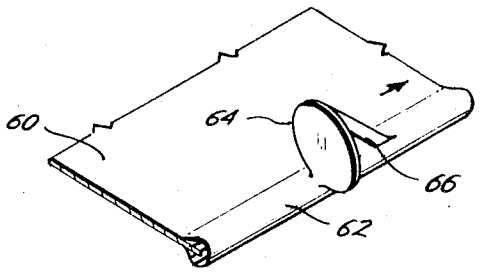


Fig. 12

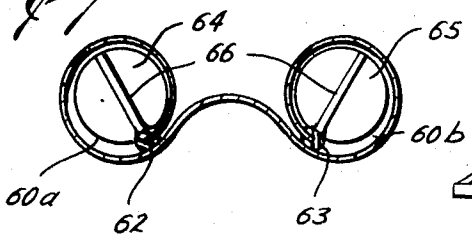


Fig. 13

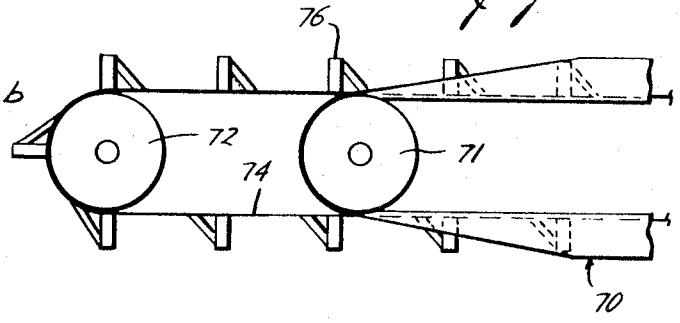
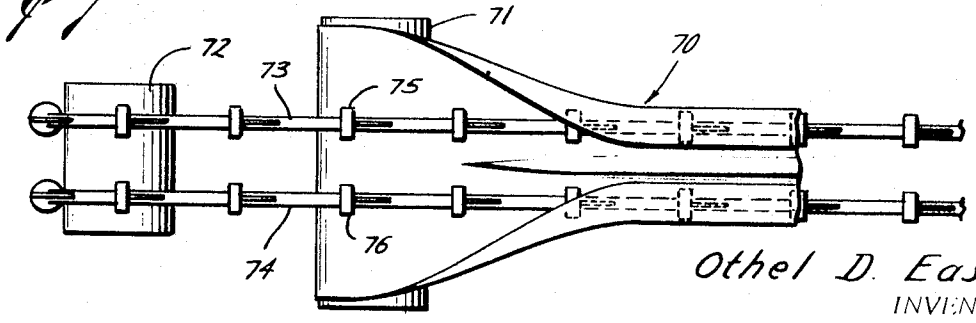


Fig. 14



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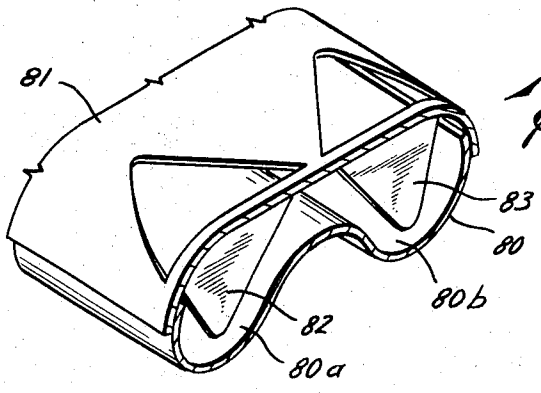


Fig. 15

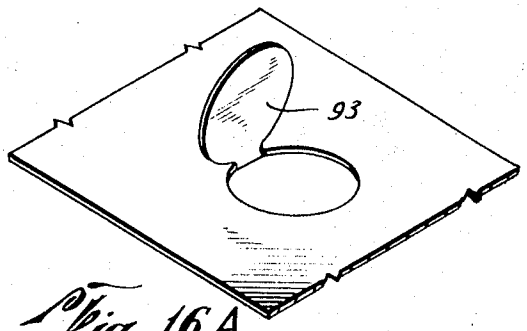


Fig. 16A

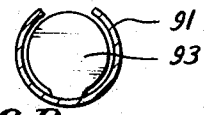


Fig. 16B

Fig. 17

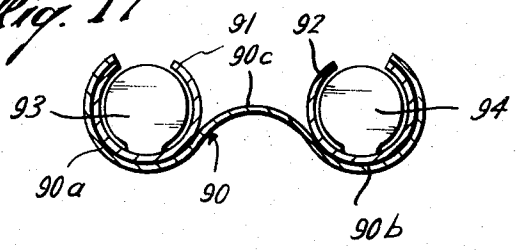
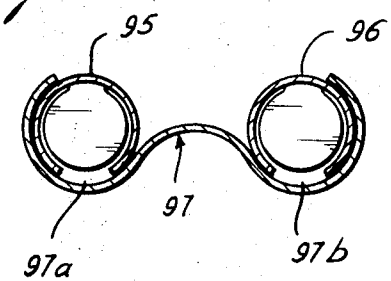


Fig. 18



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CONVEYOR AND TAPE THEREFOR

This invention relates to conveyors generally and, in particular, to conveyors of the type that employ a moving tape or belt upon which is supported the material to be conveyed. The invention also relates to a tape for use with such a conveyor.

In such conveyors, a belt or tape is moved longitudinally to carry material from one place to another. The tape can be flat, but preferably it is arcuate in cross section to give more of a trough shape to the tape, so it can carry more material for its width than it could if flat. This is commonly done by idlers that shape the belt into an arcuate cross section. This requires that the tape be somewhat flexible so it has little if any ability to support the material it carries. Therefore, many idlers are required to support this tape between the end rollers of the conveyor.

In Australian Pat. No. 225,677 a conveyor tape is described that will assume a tubular shape inherently without the need for troughing idlers. The tape described is made of a resilient material, such as spring steel, that is preformed into a tubular shape. The material from which the tape is made has sufficient resiliency to flatten while passing over end rollers and to return to its tubular shape between the end rollers. In its tubular shape, the tape has much more structural rigidity and will support itself and the material it carries over a greater span than the type belt described above, allowing the idlers to be spaced further apart.

Both the flat tapes and those preformed into a tubular shape have little resistance to twisting under unbalanced loads due to uneven loading of the material on the tape, unbalanced lateral forces, and the like. Further, such tapes are difficult to hold against such twisting or against lateral movement, due to their shape, which provides no surface that can be engaged by means that will guide it in the desired direction and also hold the tape against twisting due to the unbalanced loads discussed above.

It is, therefore, an object of this invention to provide a tape for such a conveyor that is preformed into a unique structural shape that is self supporting between idlers, that resists twisting and turning over due to unequal loading, and that will flatten when traveling around the end rollers and return to its preformed shape between the rollers.

It is another object of this invention to provide a conveyor tape that is preformed to have a longitudinally extending guide surface that can be engaged by means for supporting the tape and for holding the tape against lateral movement from the desired direction of travel.

It is a further object of this invention to provide a conveyor having drive and idler rollers and an endless tape encircling the rollers in which the tape is a strip of resilient material preformed into a shape that resists longitudinal bending and rotation around its longitudinal axis, yet will flatten as required to change its direction of travel.

It is another object of this invention to provide such a conveyor in which the tape is preformed to have a longitudinally extending guide portion that is arcuate in cross section and a longitudinally extending material carrying portion adjacent the guide portion that is arcuate in cross section to provide a trough.

It is yet another object of this invention to provide such a conveyor in which the edge of the material-carrying portion curls back upon itself to enclose the material being carried and protect it from the elements of the environment through which the tape is traveling.

It is another object of this invention to provide a tape preformed to have at least two curved sections with one section curving in the opposite direction from the other to provide structural rigidity to the tape in its preformed shape and to provide a surface to engage support and guiding rollers.

It is an additional object of this invention to provide such a conveyor having a tape that is preformed to assume a shape in the unstressed condition that provides a longitudinally extending trough in which material may be carried and a longitudinally extending guide surface that idlers can engage to support and guide the tape as it travels longitudinally.

It is another object of this invention to provide a conveyor having a tape with a material-carrying trough that encloses the material or that can be covered by another tape traveling with the first tape.

It is another object of this invention to provide a tape that can flatten as required to change directions, such as when traveling over end rollers, and that will assume a troughed shape when in a stress-free condition between such end rollers, and which has flights or lateral dividers attached to the tape that extend across the trough to help move material with the tape.

It is yet another object of this invention to provide a new and novel idler assembly for supporting a tape that will track the tape and thereby provide better guidance and support for the tape.

These and other objects, advantages, and features of the invention will be apparent to those skilled in the art from a consideration of this specification, including the attached drawings and appended claims.

The invention will now be described in connection with the attached drawings in which,

FIG. 1 is a side view in elevation of one embodiment of the conveyor of this invention;

FIG. 2 is a sectional view taken along line 2–2 of FIG. 1;

FIG. 2A is a sectional view of another embodiment of the tape of this invention;

FIG. 3 is a top view of the conveyor of FIG. 1;

FIG. 4 is a side view, generally schematic, showing an arrangement whereby the material carried by the conveyor will be covered for most of the distance it is carried by the conveyor;

FIGS. 5—9 are cross-sectional views of alternate shapes and cover arrangements for the conveyor tape of this invention;

FIG. 10 is a side view of an alternate embodiment of the conveyor tape of this invention equipped with members to assist the tape in carrying material along with it;

FIG. 11 is a partial view of the tape of FIG. 10 showing one of the material-moving members and how it is attached to the edges of the tape in this embodiment;

FIG. 12 is a sectional view through the tape of FIG. 10 taken along line 12–12 of FIG. 10; FIG. 13 is an alternate arrangement whereby members are provided for helping to move the material along with the tape;

FIG. 14 is a top view of the arrangement in FIG. 13;

FIG. 15 is a cross-sectional view showing an alternate arrangement for a cover that will provide means for helping to move the material with the tape; and

FIGS. 16, 17, and 18 illustrate yet another embodiment of the invention employing three preformed tapes.

The conveyor of FIG. 1 includes end rollers 10 and 11 and endless tape 12 that encircles the end rollers and is moved longitudinally as the end rollers rotate. Usually, one end roller is driven or caused to rotate by an outside source of power (not shown) in the conventional way. Other means can be used to move the tape, if desired. Rollers 10 and 11 are mounted for rotation in any convenient manner. Usually, the end rollers are mounted so they can be moved apart or together as required to obtain the proper tensile force in tape 12 to transmit the horsepower required to move the tape longitudinally at the desired speed, when carrying the desired amount of material.

In accordance with this invention, tape 12 comprises an elongated strip preformed into a troughlike shape in cross section with at least two sections that curve in opposite directions to provide a guide surface for engagement by guiding and supporting means. In the embodiment shown in FIGS. 1 through 5, the tape has two sections 12*a* and 12*b*, that are curved in the same direction and one section 12*c* that is curved in the opposite direction. Thus, the tape in cross section has two changes in curvature to provide one convex section 12*c* and two concave sections 12*a* and 12*b*. Whether the sections are

concave or convex, of course, depends on the position of the observer. They will be described in this specification as viewed by an observer positioned above the tape.

As shown in FIG. 1, tape 12 moves to the left from the top of end roller 11 across to the top of end roller 10. This is the material carrying portion of its travel and the return travel of the tape is from the bottom side of end roller 10 to the bottom side of end roller 11. As the tape travels around the end rollers, it is flattened. It returns to the preformed shape shown in FIG. 2 between the rollers. To accomplish this, the tape should be made of a material having sufficient resiliency to be flattened during each trip around the rollers without suffering any stresses exceeding its yield point, in other words, without suffering any permanent deformation due to the flattening. Thin spring steel is one material that can be used for this purpose. Several other metals have sufficient resiliency and endurance to be used for this service also. In addition to the metals, certain papers and plastics can also be used as well as laminates of the same or different materials.

Material is fed onto tape 12 from hopper 13. The tape carries the material with it until it dumps the material into hopper 14 as the tape flattens around end roller 10. If desired, convex section 12*c* can be curved on a shorter radius to raise it more toward the level of the edges of the tape, as shown in FIG. 2A. This will divide the tape into two separate troughs 15 and 16. Different material can be carried in each trough if desired. Also, only one trough can be used at a time, if for some reason this is desired.

Means are provided to engage the guide surface on the tape for supporting the tape and for guiding the tape as it travels between the end rollers. Said means also tend to hold the tape against movements due to lateral forces, such as side winds. In the embodiment shown, idler assembly 17 has two roller assemblies, comprising rollers or wheels 18 and 19, mounted for rotation around parallel axes transverse the direction of travel of the tape. The rollers are located in tandem between the material carrying pass and the return pass of the tape. The rollers engage the bottom of the groove formed in the tape by convex section 12*c* and support the tape and the material it is carrying. The rollers also guide the tape and hold it against lateral movement. The rollers are mounted for rotation on shafts 20 and 21, respectively.

To support the return pass of tape 12, rollers 23 and 24 are provided. These wheels are mounted side by side on shaft 25. They are spaced apart and located to engage the upwardly sloping sides of convex section 12*c* to support and guide the tape on its return pass. As shown, rollers 23 and 24 hold the return portion of the tape in engagement with the lower side of rollers 18 and 19. This allows rollers 18 and 19 to help guide the return pass also.

The idler assembly also includes three pairs of side rollers 27, 28, and 29. Pair 29 is on the opposite side from the other side rollers. Each pair has two spaced rollers, such as rollers 28*a* and 28*b* of pair 28. In the drawings, the side rollers appear to be touching the tape. Preferably, however, the rollers are spaced slightly from the tape and engage it only should the tape move laterally with respect to guide and support rollers 18 and 19.

Side rollers 27 and 28 are mounted for rotation on shafts 30 and 31, respectively. Side rollers 29 are mounted on shaft 25. This shaft also continues upwardly to connect the idler assembly to its supporting structure. The assembly is shown pivotally attached to a rod or cable 32. This allows rollers 18 and 19 to give a trapezelike support to the tape and to track the tape by pivoting around the axis of rod 32 which is generally parallel to the direction of travel of the tape.

On long runs between end rollers, it may be desirable to have the tape travel other than in a straight line. This can be done by separately supporting the portions of the idler assembly that support the upper and lower passes of the tape and rotating them to cause one side of the tape to drop and the other to rise as required for the tape to make a gradual turn. The tape can be provided with shallow transverse corrugations for this purpose, if desired.

On occasion, it may be desirable to cover the material being carried by the tape to protect it from the ambient atmosphere or to keep the material, if it is light and fluffy, from being blown from the tape. FIG. 4 shows how second tape 35 can be arranged to run between end rollers 36 and 37 to cover tape 38 carrying material between end rollers 39 and 40. FIG. 5 is a cross section through tape 38 and cover tape 35. Tape 38 is approximately the same shape in cross section as tape 12 previously described. Cover tape 35 is shown slightly arcuate in cross section and is designed to lay across the upwardly open portion of tape 38 to cover the material covered by tape 38. The cover tape should travel at the same speed as the tape that is covering.

FIG. 6 shows an alternate arrangement for enclosing the material carried by a tape. Here tape 40, which is generally the same configuration as was tape 12 and tape 38, is covered by tape 41, which is preformed also to have substantially the same shape as the tape it is covering. Further, the edges of both the material-carrying tape and the cover tape are provided with longitudinally extending seal means. Tape 40 has seals 42*a* and 42*b* and tape 41 has seals 43*a* and 43*b*. These seal means, which may be strips of rubber bonded to the edges of the material making up the tape, engage the other tape and provide a seal to protect the material carried by the tape from the ambient atmosphere.

FIG. 7 is an alternate embodiment of the tape of this invention. It has three sections 45*a*, 45*b*, and 45*c* that are concave, as viewed from above the tape, and two sections, 45*d* and 45*e*, that are convex and curved in the opposite direction from sections 45*a*, 45*b*, and 45*c* The two convex sections are located on opposite sides of section 45*b* and provide longitudinally extending guide surfaces to be engaged by idler wheels 46 and 47 to support and guide the tape as it moves longitudinally. This tape has an advantage over the shape used for tape 12 in that it forms a trough that is larger in cross section for the same width of tape than did the previously described tape. This tape can be covered by cover tape 48, shown dotted in FIG. 7, in the same manner as described above in connection with tapes 38 and 40.

FIGS. 8 and 9 are other possible shapes for the tape of this invention. In FIG. 8, tape 50 has two concave sections 50*a* and 50*b* and a central convex section 50*c*. This tape differs from tape 12 in that concave sections 50*a* and 50*b* are tubular in shape with edges 51 and 52 of the tape curling inwardly until they engage the tape adjacent the edges of section 50*c*. Longitudinal seal means 53 and 54, bonded to the edge of the tape, engage the tape when the edges curl back in to provide two parallel tubular troughs, in which the material carried therein are sealed from the ambient atmosphere.

Tape 56 of FIG. 9 has the same shape in cross section as tape 50 in FIG. 8 except that convex section 56*c* is thicker than the rest of the tape. Generally the bending stress imposed on this section of the tape, when it flattens going around the end rollers, is less than in the other portions of the tape. This being the case, this section can be made thicker to provide more cross-sectional area for transmitting horsepower to the tape. Another place where this could be done is adjacent outer edges of the tape where the bending stress imposed by flattening the tape is also at a minimum.

In connection with the longitudinal stress on the tape, it might be pointed out that another advantage and feature of this invention is that it brings the edges of the tape inwardly toward the center of the tape. This is important because with flat or tubular tapes slight misalignments in the end rollers can cause sharp increases in the stress adjacent one edge of the tape and actually cause the edge to buckle. By shaping the tape as shown and bringing the edges of the tape toward the center of the tape, these buckling stresses will be imposed on sections of the tape that are inward from the edges and that can withstand these higher stresses.

In FIGS. 10, 11 and 12 another alternate embodiment of the invention is shown. Tape 60 is shown in FIG. 10 traveling around end roller 61. Tape 60, as shown in FIG. 12, is preformed in substantially the same shape as tape 50 of FIG.

8. In addition to sealing strips 62 and 63 attached to the edges, there are a plurality of discs 64 and 65 attached opposite edges of the strip at spaced intervals therealong. These discs are positioned to extend transverse circular troughs 60*a* and 60*b* of tape 60, formed when the tape is in its preformed position, as shown in FIG. 12. The discs, preferably, are integrally attached to sealing strips 62 and 63, which in turn are bonded securely to the edges of the tape. Straps 66 are positioned forwardly of the discs to help support the discs and keep them from being bent rearwardly by the force of the material carried in the troughs. These discs then, when positioned transverse the troughs as shown in FIG. 12, will divide the troughs into compartments and assist the conveyor in carrying material along with it. This is particularly advantageous when moving material up an incline, or when it is required to accelerate the material rapidly after it is fed into the tape.

FIGS. 13 and 14 are yet another embodiment of the invention directed to accomplishing substantially the same thing as accomplished by the embodiment of FIGS. 8, 9, and 10. Here tape 70 is preformed into the same shape as tape 60 of FIG. 12. It travels around end roller 71. Positioned beside end roller 71 is another end roller 72 around which travel elongated strips 73 and 74. Attached to these strips at spaced intervals are discs 75 and 76, respectively. These discs, preferably, substantially fill the cross-sectional area of the troughs formed by the tape, when it assumes its preformed shape. By rotating end roller 72 so that discs 75 and 76 move at the same speed as tape 70, they can be used to divide the troughs into compartments as they move between the end rollers, and assist the tape in moving material up or down an incline or in accelerating material rapidly, as it is being fed into the tape.

FIG. 15 shows another way of dividing the troughs formed by the tape of this invention into compartments for assisting and moving material with the tape. In this embodiment the material in tape 80 is covered by tape 81. Tape 81 is provided with triangular sections 82 and 83 that are bent downwardly out of the plane of the cover tape to extend into troughs 80*a* and 80*b* of tape 80. The purpose again is to assist in moving material with the tape.

FIGS. 16*a* through 18 show yet another embodiment of the conveyor of this invention. Referring first to FIG. 17, tape 90 is preformed in cross section generally in the same shape as tape 12, described in connection with FIG. 1. As preformed, the tape is troughlike in cross section and the trough it forms has two subtroughs 90*a* and 90*b* located on opposite sides of convex section 90*c*. Located in each of subtroughs 90*a L and* 90*b* are circular, tubular-shaped tapes 91 and 92, respectively. These tapes are similarly constructed so only one will be described in detail. Tape 91 for example is preformed into a tubular shape so that it will flatten when passing over an end roller, but will return to a tubular shape therebetween. Also, prior to being preformed, circular tabs 93 are punched out of the center portion of the tape, as shown in FIGS. 16*a* and 16*b*, and bent upwardly to provide a partition extending transverse the tape, when the tape is in its preformed shape. Tape 92 is provided with similar tabs 94. Tapes 91 and 92 then are located in subtroughs 90*a* and 90*b* of tape 90, as shown in FIG. 17. When tabs 93 and 94 are punched out of the tapes they leave a hole in the tape, of course. By carrying them along in subtroughs 90*a* and 90*b*, however, tape 90 serves to close the holes formed in these tapes by the punching operation.

An alternate arrangement is shown in FIG. 18, where tapes 95 and 96, which are formed in the same way as tapes 91 and 92 described above, are rotated 180° from the position of tapes 91 and 92 of FIG. 17. These tapes serve to help move the material with the tape.

From the foregoing description of one embodiment of this invention by way of example, it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth, together with other advantages which are obvious and which are inherent to the apparatus and structure.

The invention having been described, what I claim is:

1. A conveyor tape comprising an elongated strip preformed into a troughlike shape in cross section with at least two sections curved in cross section in opposite directions to provide a guide surface for engagement by guiding and supporting means, said tape being made of a material having sufficient resiliency to flatten as required to change its direction of travel, without exceeding the elastic limit of the material, and to return to its preformed shape after it has changed its direction of travel.

2. The tape of claim 1 in which three sections of the tape curve in the same direction in cross section and two sections of the tape curve in the opposite direction, said latter two sections being located on opposite sides of the middle one of the first three sections to thereby shape the tape in cross section like a trough.

3. The tape of claim 1 in which the tape has two sections curved in the same direction in cross section and one section curved in the opposite direction located between the other two.

4. A conveyor tape for moving material from one place to another comprising an elongated strip preformed into a troughlike shape that is at least partially curved in cross section, said tape having at least one change in curvature from convex to concave to provide a guide surface for engagement by guiding and supporting means, said tape being made of a material having sufficient resiliency to flatten as required to change its direction of travel, without exceeding the elastic limit of the material, and to return to its preformed shape after it has changed its direction of travel.

5. The conveyor tape of claim 4 in which the concave portion of the curve is generally circular when the tape is in its preformed shape to provide the tape with a tubelike material-carrying section.

6. The tape of claim 4 in which the curvature of the tape in its preformed shape changes its direction of curvature four times to form three concave sections connected by two convex sections with the central concave and the two convex sections providing the guide surface of the tape.

7. The tape of claim 4 in which the curvature of the tape in its preformed shape changes its direction of curvature two times to form two concave material-carrying troughs separated by a convex section between the troughs that provides the guide surface.

8. The tape of claim 4 in which the thickness of the tape varies as allowed by the variation in stress imposed on the tape when the tape is flattened as required to change its direction of travel.

9. A conveyor tape comprising an elongated strip having a longitudinally extending surface that is arcuate in transverse cross section with at least two portions curved in cross section in opposite directions to provide a tracking surface for engagement with means for supporting the tape and the material it carries and for guiding the tape in the desired direction and a longitudinally extending material-carrying trough spaced from the tracking surface, said tape being made of a material having sufficient resiliency for the arcuate tracking surface and trough to flatten as required when the tape changes its direction to travel and thereafter return to its preformed shape.

10. A conveyor comprising an elongated strip preformed into a troughlike shape in cross section with at least two sections curved in cross section in opposite directions to provide a guide surface for engagement by guiding and supporting means, said tape being made of a material having sufficient resiliency to flatten as required to change its direction of travel without exceeding the elastic limit of the material and to return to its preformed shape after it has changed its direction of travel, means for engaging the guide surface to support the tape and to guide the tape in the desired direction, including means for holding the tape against lateral movement from the desired direction of travel and means for changing its direction of travel.

11. The conveyor of claim 10 further provided with a plurality of longitudinally spaced members for movement with

the tape to hold material on the tape against movement longitudinally of the tape.

12. The conveyor of claim 11 in which the members are attached to the tape for positioning transverse the direction of travel of the tape when the tape is in its preformed shape.

13. The conveyor of claim 10 further provided with a second tape and means for moving the second tape with the first tape to cover the material carried by the first-mentioned tape.

14. The conveyor of claim 13 in which the second tape is provided with a plurality of members longitudinally spaced therealong that extend transverse the direction of travel of the tape and urge the material in the first tape to move with it.

15. The conveyor of claim 10 in which the means for supporting and guiding the tape include an idler assembly having two roller assemblies, means mounting the assemblies in tandem to engage the guide surface at longitudinally spaced locations, and to hold the assemblies in longitudinal alignment.

16. The conveyor of claim 15 in which the mounting means includes means permitting the roller assemblies to rotate around a common axis generally parallel to the direction of travel of the tape to permit the roller assemblies to freely track the tape.

17. The conveyor of claim 15 in which each roller assembly includes two rollers.

18. A conveyor comprising end rollers and an endless tape encircling the rollers for movement around the rollers, said tape being preformed to provide spaced, parallel, longitudinally extending troughs in which material may be carried and a central longitudinally extending ridge between the troughs, said tape being made of a material having sufficient resiliency for the tape to flatten as required to change its direction of travel and to inherently return to its preformed shape between the end rollers.

19. The conveyor of claim 18 in which the troughs are generally circular in cross section when the tape is in its preformed shape.

20. The conveyor of claim 19 further provided with seal means located on the edges of the tape for engaging the tape, when the tape is in its preformed shape, to protect the material in the troughs from the ambient atmosphere.

21. The conveyor of claim 18 further provided with two additional rollers and a second endless tape encircling the rollers for longitudinal movement between the rollers being positioned above the conveyor such that the second tape travels with and covers the two troughs of the first tape.

22. The conveyor of claim 18 further provided with a plurality of longitudinally spaced discs attached to the edge of the tape for positioning transverse one of the troughs when the tape is in its preformed shape to provide compartments for carrying material along with the tape.

23. The conveyor of claim 18 in which the central ridge is thicker material than the troughs.

24. A conveyor comprising two spaced end rollers, means for rotating one of the end rollers, and endless tape encircling the rollers to be moved longitudinally by rotation of the end rollers with the material-carrying portion extending from the upper side of the rollers and the return portion extending between the lower side of the rollers, said tape comprising an elongated strip preformed to have a central ridge extending longitudinally of the tape and two troughs for carrying material with the tape as it moves between the end rollers, each located on the opposite side of the central ridge from the other and extending longitudinally of the tape in spaced, parallel relationship, said tape being made of a material having sufficient resiliency to flatten, when passing over the end rollers and to return to its preformed shape between the end rollers, and a plurality of idlers spaced between the end rollers engaging the tape below the central ridge of the material-carrying portion of the tape to guide and support the tape as it travels between the end rollers.

25. The conveyor of claim 24 further provided with idlers for engaging the central ridge portion of the return portion of the tape to guide and support it between the end rollers.

26. A tape for a conveyor having rollers encircled by the tape to be moved longitudinally by the rollers, said tape comprising an elongated strip preformed to have at least two longitudinally extending arcuate portions having different centers of curvature to provide a guide portion that is arcuate in transverse cross section for engaging tape-supporting and guiding means and at least one material-carrying portion parallel to the guide portion, said elongated strip being of a material having sufficient resiliency for the arcuate guide and material-carrying portions to flatten as the tape travels over the end rollers and to return to its preformed shape between the rollers.

27. A material conveyor comprising two spaced rollers and first and second tapes engaging the rollers for movement longitudinally around the rollers, said tapes being elongated strips of thin, resilient material preformed to assume a tubular shape between the rollers inherently and which are capable of being flattened temporarily as the tapes roll over the rollers, said tapes being positioned so that the second tape at least partially encloses the first tape when the tapes are in their tubular shape so that the second tape will add support to the first tape as it travels between the rollers, said first tape having a plurality of longitudinally spaced flights integrally attached thereto, said flights comprising portions of the tape that are partially sheared from the tape and bent out of the plane thereof with said second tape serving to close the openings in the first tape left by the flights sheared from it.