Jan. 31, 1939. P. J. BIRKMEYER 2,145,786

CONVEYER BELT

Filed March 5, 1936

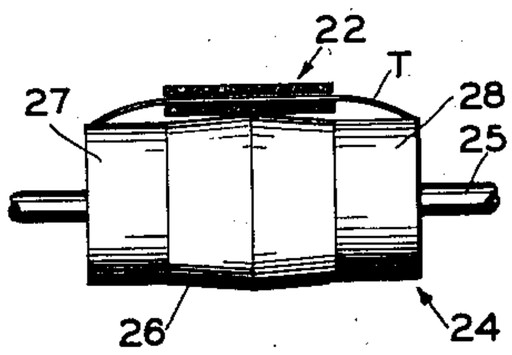

FIG. 7

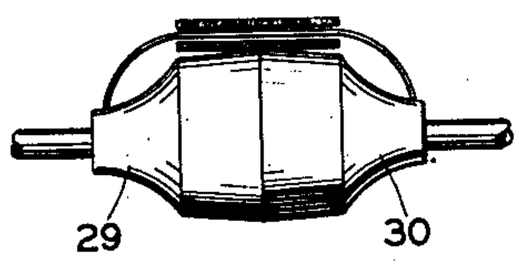

FIG. 8

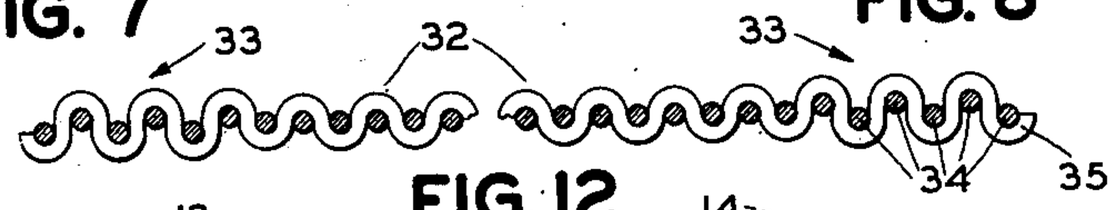

FIG. 12

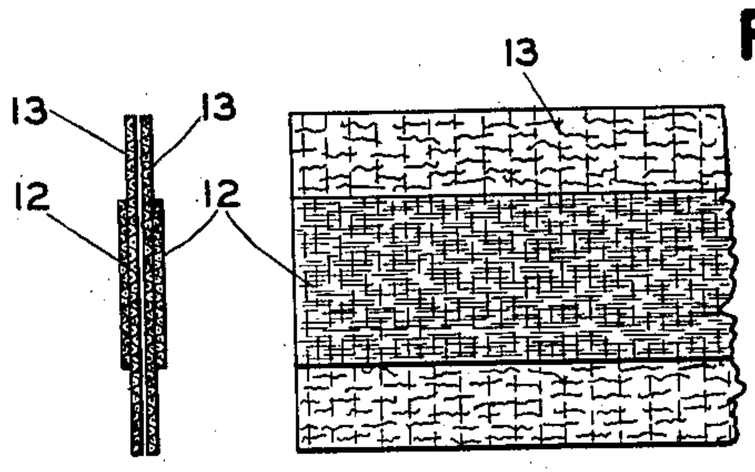

FIG. 2

FIG. 1

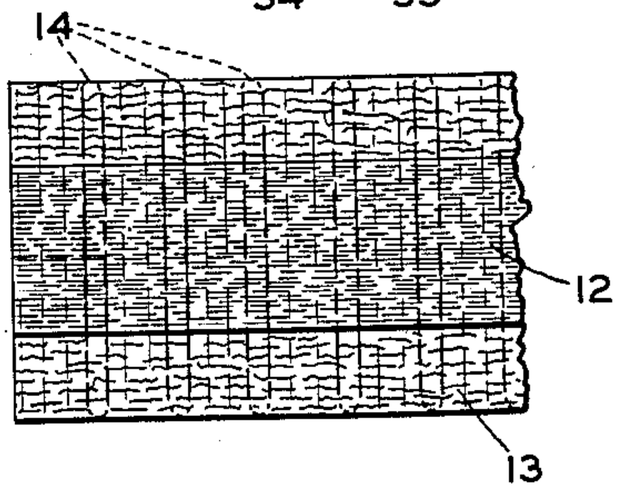

FIG. 3

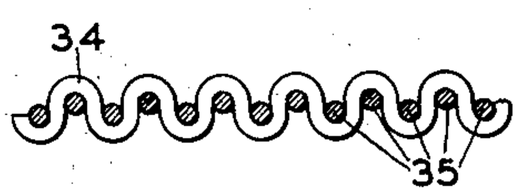

FIG. 10

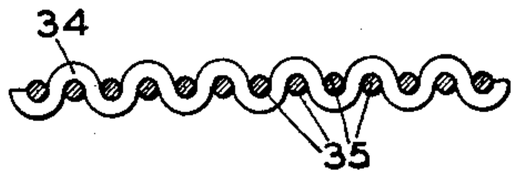

FIG. 11

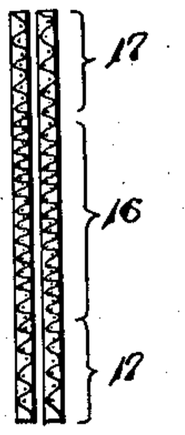

FIG. 5

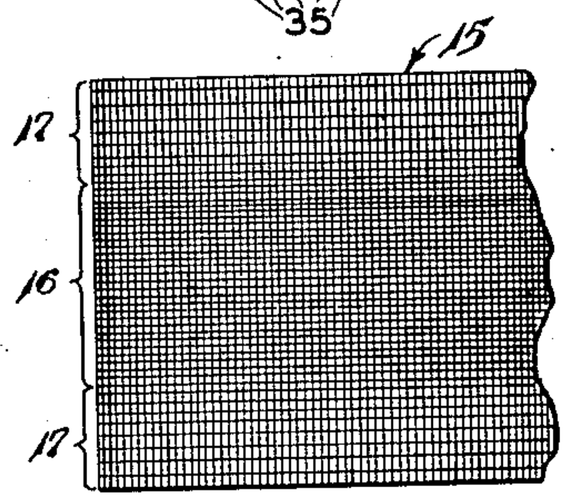

FIG. 4

FIG. 6

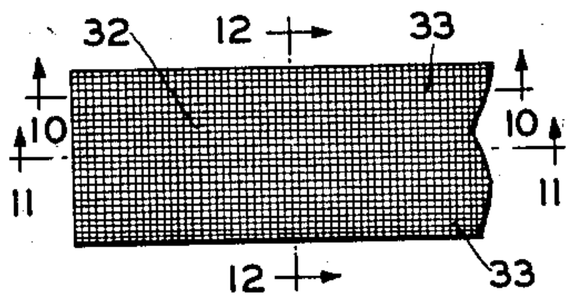

FIG. 9

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CONVEYER BELT

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Application March 5, 1936, Serial No. 67,389

16 Claims. (Cl. 198—165)

This invention relates to belt conveyers in which sheet material is carried between two flat belts, and has particular reference to an improved type of conveyer belt.

Conveyer belts are quite extensively used for conveying sheet material, telegram blanks, messages, and the like, from one part of a building to another. For certain purposes, and under certain conditions, a double or multiple strap conveyer, with which type the present invention is chiefly associated, has been found to be most suitably adapted. Such a conveyer is highly desirable for use in carrying light, flexible sheet material for inter-office communication, and is often necessary where for some reason it is impractical to install the well known drag type of conveyer in which the sheet material is carried between a stationary guide member and a belt by frictional engagement with the latter.

The double strap conveyer comprises two parallel belts traveling in the same direction with their inner faces in engagement with each other. This type of conveyer is ordinarily supported by means of the direction changing rollers and other suitable guide members conveniently spaced therebetween. It has been found that whenever the conveyer must span a relatively wide gap without the cooperation of any support member for the belts, there is a tendency for the belts to separate, thus allowing the message to fall out. In addition to this difficulty there has been noted a tendency for one belt or strap to creep over the other when they are both passing around the same direction changing pulley.

To counteract the tendency of the belts to separate or slip, and to increase the gripping action of one belt upon the other, it is sometimes customary to give the belts one or more twists between rollers wherever the gap is wide enough to permit the same. Any number of twists may be given the belts, limited somewhat, of course, by the rigidity of the belt material and by the thickness or width of the belt.

One of the chief difficulties encountered in twisting a conveyer belt in the past has been the tendency for the edges to curl or fold toward its longitudinal center. This is due to a large extent to the fact that as the belt is twisted, a point on its outer edge travels a helical, and hence a longer, path than a point at the center, thus causing the longitudinal belt fibres or strands to be proportionately elongated or stretched according to their lateral distance from the center. The tendency of the stretched portion to seek the shortest path, or the one of least resistance, sometimes causes the outer edges of the belt to curl over or fold toward the center where the path is shortest. This curling or folding of the belt causes it eventually to lose its shape, with the result that the outer edges of the belt become wavy or non-planiform in shape and the effective gripping surface of the belt is materially decreased.

Hence, one of the objects of this invention is to provide a belt material having a relatively non-elastic longitudinal central portion and elastic outer portions so that when the outer portions of the belt are stretched and released, they will reassume their normal shape.

Another object is to provide a belt material which is reinforced transversely so as to be relatively non-flexible or resistant to curling from the edges toward the center.

Still another object is to provide a conveyer belt which, when used with a double strap twist conveyer, will not permit the sheet material to wrap around the belt as it is twirled around in its travel through the twisted portion of the conveyer.

A further object is to provide a woven fabric belt material in which the transverse fibres or strands are non-elastic and equi-spaced and in which the longitudinal strands are non-elastic at the center portion of the belt and increasingly elastic toward the edges.

Another object is to provide a woven fabric belt material having the central strands of the warp tightly woven and the outer strands loosely woven and having a uniform weft.

These and other objects of my invention will be apparent from the following description and claims taken in connection with the accompanying drawing in which:

Fig. 1 is a fragmentary top view of a portion of belt material composed of two separate layers of different widths suitably joined together;

Fig. 2 is an end view of two such belts, as shown in Fig. 1, arranged in conveying relation;

Fig. 3 is a modified form of the belt material shown in Fig. 2 in which a series of reinforcing strips are inserted in the weave of the belt;

Fig. 4 shows a fragmentary portion of belt material having a varied weave from the central portion to the outer edges;

Fig. 5 shows an end view of two such belts, as shown in Fig. 4, in conveying arrangement;

Fig. 6 shows a modified form of belt material arranged in a twist formation;

Fig. 7 shows a belt pulley designed to prevent messages from becoming wrapped about the conveyer belt;

Fig. 8 is a modified form of belt pulley;

Fig. 9 shows a fragmentary portion of varied-weave belting in which the warp and weft are uniform as to spacing but vary as to the tension on certain strands;

Fig. 10 is an enlarged cross-section view taken along the line 10—10 of Fig. 9;

Fig. 11 is an enlarged section view taken along the line 11—11 of Fig. 9; and

Fig. 12 is an enlarged view taken along 12—12 of Fig. 9.

Referring now to the drawing, Fig. 1 shows a fragmentary view of a length of belt material composed of two layers joined one above the other. A length of heavy closely woven, and comparatively non-elastic belting 12 consisting of rubberized fabric, tightly woven duck or canvas, or similar material, is laterally centered on, and affixed longitudinally along, the entire length of a substantially wider and thinner piece of fabric belting 13, the latter having a substantially stiff weft and a substantially flexible and elastic warp. There is thus formed a belt having a double or reinforced center portion and overhanging side portions. The outer surface of the wide layer forms the sheet engaging or conveying surface of the belt. The two layers are permanently joined together by any suitable means, as by stitching or clipping.

With this type of belting it is possible to stretch the material at the outer edge while the center portion of the belt remains substantially unchanged. This is particularly desirable where the belt is given one or more twists, thus causing the outer edges of the belt to be subjected to more tension than the center portion. This construction also permits the belt material to reassume its normal shape after having been stretched and distorted in operation.

Fig. 2 shows a sectional end view of a double strap arrangement comprising two belts, as shown in Fig. 1, arranged in conveying relation. It will be noted that the outer face or working surface of the elastic portion 13 of each belt adjoins or faces the corresponding surface of the other belt. That is, the belts are so arranged that the message blank or sheet material will travel between and be held by frictional engagement with the broad faces of the belts.

Fig. 3 shows a modified arrangement of the belt material shown in Figs. 1 and 2, with the additional feature of having the lower or wide belt layer 13 reinforced transversely by splints or strips 14 inserted between the strands or fibres of the woven fabric and spaced at equal intervals along the entire length of the belt. The splints 14 are constructed of material of less flexibility than the fabric in which they are inserted and extend the entire width of the belt so as to reinforce the same and prevent the latter from curling transversely toward the center. As the belt is twisted in spiral fashion, these splints 14 serve to maintain the belt in a manner to cause a transverse element at any point along the conveyer path to be in a substantially straight line.

Fig. 4 shows a section of varied-weave conveyer belt material 15 comprising a single layer or flat strip of woven fabric. The belt material is constructed so that the center portion 16 comprising about one-half of the total width of the belt will have a very close weave and sturdy construction with the longitudinal strands being substantially non-resilient and equi-spaced. From the center portion 16 to the outer edges, the longitudinal strands of the marginal portions 17 are gradually varied as to both spacing and resiliency, so that the outer edges of the belt have a relatively high degree of resiliency. Throughout the entire length of the belt fabric the transverse strands are uniformly spaced and tensioned and are of a strong, non-resilient material. Whenever the belt is subjected to a series of twists, and operated under conditions tending to cause certain longitudinal strands to be stretched more than others, this construction serves to prevent the edges from curling or folding, and at the same time minimizing permanent deformation of the belt.

It also permits the use of a wider belt than has heretofore been practical for use in twist conveyers because the outer portions of the belt may expand or contract as necessary under varying conditions of operation.

Fig. 5 shows an end view of two such varied-weave belts in conveying arrangement. It will be observed from the drawing that the belt material is of even thickness across its entire width but that the longitudinal strands are more loosely spaced at the edges than at the center. By constructing the belt material of even thickness throughout, it is possible to have an even pressure between the sheet engaging belt faces at all points, so that the gripping action on the sheet material will not be greater at the central portion than at the edge portions.

Fig. 6 is a perspective fragmentary view of a double strap conveyer embodying a twist. In operation, it is desirable to have the sheet material transported from one place to another with the greatest dispatch possible, thus introducing the factor of air resistance. While a thin sheet traveling edge foremost is not appreciably affected by air resistance, a sheet traveling along a twist conveyer and having its plane revolved in spiral fashion at a high rate of speed is affected by air resistance in a manner causing it to wrap around the conveyer belts.

Referring to the figure, I have shown a double strap conveyer comprising two belts 18 of identical construction, each embodying a main belt 19 of somewhat rigid and sturdy construction, and having affixed to one face thereof a second belt 20, said belt being substantially wider, more flexible and more resilient than the first. These two belt layers are joined together so that the broader belt overlaps the narrower belt on one side only. The outer face of the wider belt provides the working or sheet engaging surface, and has formed along, or affixed at, its outer edge a raised strip 21 of rubber, or other material having a high frictional characteristic, extending longitudinally along the entire length of the belt so that it may exert a strong gripping action on the sheet material coming in contact therewith.

It will be noted from the figure that when two such belts are arranged with their working surfaces contacting each other, and with the belt portions 19 in vertical alinement, the overlapping belt portions are oppositely projecting. The belt conveyer is twisted in the direction indicated so that the overlapping portions will follow and urge around in spiral fashion the projecting portions of sheet material, such as T, inserted between the belts. With this arrangement the belts may be constructed wide enough so that the portions of the projecting sheet material that are subjected to the air pressure as they revolve will be provided with a backing so that they will be prevented from curling about the belt. In addition, the air pressure will force the

outer portions of the sheet material against the friction strips **21**, thus increasing the gripping action of the belt.

Fig. 7 shows a modified form of belt pulley designed to straighten out messages that have been caused to curl under the belt so that the same will not catch against and be mutilated by the pulley, or be folded under the belt as it passes over and around the pulley. A double strap conveyer **22** with a message blank T inserted therebetween is shown passing over a pulley **24** mounted on a shaft **25**. The pulley comprises a main belt engaging portion **26** slightly crowned or tapered up toward the center and of a width substantially equal to that of the belts. The pulley is cylindrically extended at both sides **27** and **28** to engage and lift the curled edges of the sheet material as it passes over the roller.

Fig. 8 shows another modified form of belt pulley designed to accomplish the same purpose but having the extended portions of the pulley tapering toward the shaft as at **29** and **30**.

Fig. 9 shows a modified form of varied-weave belting in which the strands of the warp and weft are substantially equi-spaced, but wherein the tension of certain strands is varied to produce a fabric having zones of varying resiliency. The longitudinal strands at the central portion **32** of the belt **31** are drawn tightly so that the resiliency of the belt as a whole will be limited by resiliency of the central portion. The outer portions **33** of the belt are constructed with the longitudinal strands loosely woven so that they may readily be stretched. The effect of this variation is shown more clearly in Figs. 10 and 11.

Fig. 10 is an enlarged view of a section of fabric belting wherein the warp comprises loosely woven strands. It will be noted that the warp thread **34** takes a pronounced undulatory course as it passes over and under the weft threads **35**. This looseness permits the adjacent weft threads to be substantially offset from the mean center line. With this construction the thread **35** may be easily stretched.

Fig. 11 shows the effect of drawing the warp thread **34** tightly through the weft. Here it will be observed that the warp has been made to follow the shortest possible path through the weft. In this case the weft threads **35** are all in a substantially straight line. It is thus apparent that the variation in resilient properties between a section of belting having a loose weave and a section having tightly woven strands is caused by the ability of the strands to change their configuration.

Fig. 12 shows an enlarged sectional view of the belting shown in Fig. 9, taken along the line **12—12**. A portion of the tightly woven center portion has been cut away to shorten the figure. At the central portion **32** of the belt, the warp threads **34** are drawn tightly and their centers are in a substantially straight line. At the outer portion **33** the loose warp strands are slightly offset from the center line and hence the warp thread **35** will have a path substantially as shown.

As with the varied-weave belting in which the spacing of the strands is non-uniform, this type of belt fabric permits the outer edge portions to be stretched independently of the central portion.

From the foregoing description it will be observed that I have provided a novel belt construction that is especially desirable for use with twist conveyers or any type of conveyer wherein the outer portions of the belt are subjected to a greater strain than the central portion, and wherein there is a tendency for the belt to curl and become stretched and distorted.

It is obvious, of course, that various other modifications of the construction shown herein may be made without departing from the spirit or essential attributes of the invention, and therefore, I do not desire to be limited to the specific details shown and described.

What I claim is:

1. A conveyer belt material comprising a woven fabric embodying a non-uniform warp, said warp being substantially non-resilient at the center and increasingly resilient toward the outer edges, and a substantially uniform and non-resilient weft.

2. A fabric conveyer belt material comprising a non-uniformly spaced warp, said warp being closely spaced at the center and increasingly spaced toward the outer edges, and a weft having a substantially uniform spacing.

3. A woven fabric conveyer belt material comprising a non-uniform warp, the central strands of which are close together and the outer strands of which are further spaced and more resilient, and a uniform weft having strands which are relatively non-resilient and uniformly spaced.

4. A fabric conveyer belt comprising a warp having closely adjacent strands at the center portion and wider spaced and more resilient strands toward the outer edges, and a weft having uniformly spaced substantially non-resilient strands, whereby said outer portions of the belt may be stretched independently of said center portion.

5. A fabric conveyer belt comprising a warp having closely adjacent strands at the center portion and spaced wider and more resilient strands at the outer portions, and a weft having uniformly spaced substantially non-resilient strands, said belt having a uniform thickness throughout.

6. A conveyer belt comprising two layers, one of said layers being composed of a strong relatively non-resilient material and the other layer being substantially wider than said first layer and composed of a more resilient material, said second layer being affixed to said first layer so that only the overhanging portions of said second layer may be materially stretched.

7. A conveyer belt comprising a resilient belt member, a second belt member of less resilient construction substantially narrower than said first member and affixed longitudinally thereto along the center of one face, the opposite face of said first member providing the working or engaging surface of said belt.

8. A fabric conveyer belt composed of two layers, the first or lower layer comprising a thin resilient fabric, and the upper or second layer comprising a heavy non-elastic material, said upper layer being substantially narrower than said lower layer and affixed longitudinally along the center thereof to provide equal overhanging portions whereby said narrow belt layer prevents stretching of the belt as a whole while the resiliency of the overhanging portions of the wide layer permits elongation of the outer portions whenever said belt is twisted.

9. A conveyer belt as disclosed in claim 8 and having inserted in the weft of said lower fabric layer a plurality of stiffening members whereby said layer is rendered resistant to transverse bending.

10. A conveyer belt as disclosed in claim 8 and

being provided with a plurality of transverse splint members extending the entire width of the belt and affixed to the lower layer, said splints being being relatively non-flexible and spaced therealong at intervals to restrain transverse flexion of said belt.

11. A conveyer belt comprising a main belt member of sturdy and substantially non-resilient construction, a second and substantially wider belt member of resilient construction affixed to the lower face of said first belt member and having the overhanging portion projecting from one side of said first belt member, and a raised strip portion projecting from the lower face of said second belt member and extending longitudinally along the overhanging edge thereof.

12. In a belt conveyer system a double strap belt arranged to carry sheet material therebetween, supports for said belt, one or more twists in said belt between said supports, said belt comprising a broad resilient belt member having affixed to one side of its upper surface a substantially narrower belt member, said member being non-resilient and of relatively sturdy construction, and a substantially narrow raised strip extending longitudinally along and projecting downwardly from the lower face of said broad belt member at the opposite side thereof, whereby, when two such belts are disposed in double strap arrangement with the lower faces contacting each other, the overhanging portions will be oppositely projecting so that sheet material inserted between said belts will have their opposite faces contacted by the narrow strip members.

13. A belt conveyer system for conveying and maintaining message blanks in an unfolded condition comprising a pair of belts, each of said belts having a marginal portion relatively elastic in a longitudinal direction and being relatively inelastic longitudinally adjacent said marginal portion, pulleys for supporting said belts, said belts being twisted between said pulleys, and causing said marginal portions to travel a longer path than that taken by said inelastic adjacent portion, the relative elasticity of said marginal portion preventing lateral curling of the belt.

14. The conveyer system of claim 13 wherein each of said belts is provided with a relatively narrow raised strip projecting from the surface which is in contact with the other belt whereby said blanks inserted between the belts will have their face or faces contacted by the narrow strip members.

15. A conveyer belt for a double belt conveyer system in which a pair of twisted contacting belts are employed to carry blanks flatwise, said belt comprising a longitudinally elastic marginal portion and a less elastic portion adjacent said marginal portion whereby to prevent said belt from doubling upon itself in use.

16. A conveyer belt for a double belt conveyer system in which a pair of twisted contacting belts are employed to carry blanks flatwise, said belt comprising longitudinally elastic marginal portions and a less elastic portion extending longitudinally of said belt between said elastic portions.

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