

Oct. 6, 1953

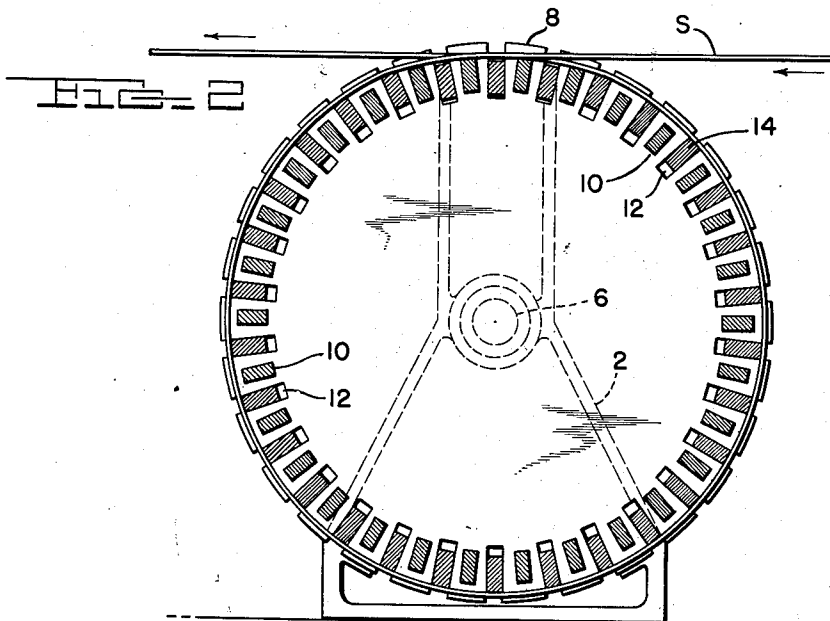
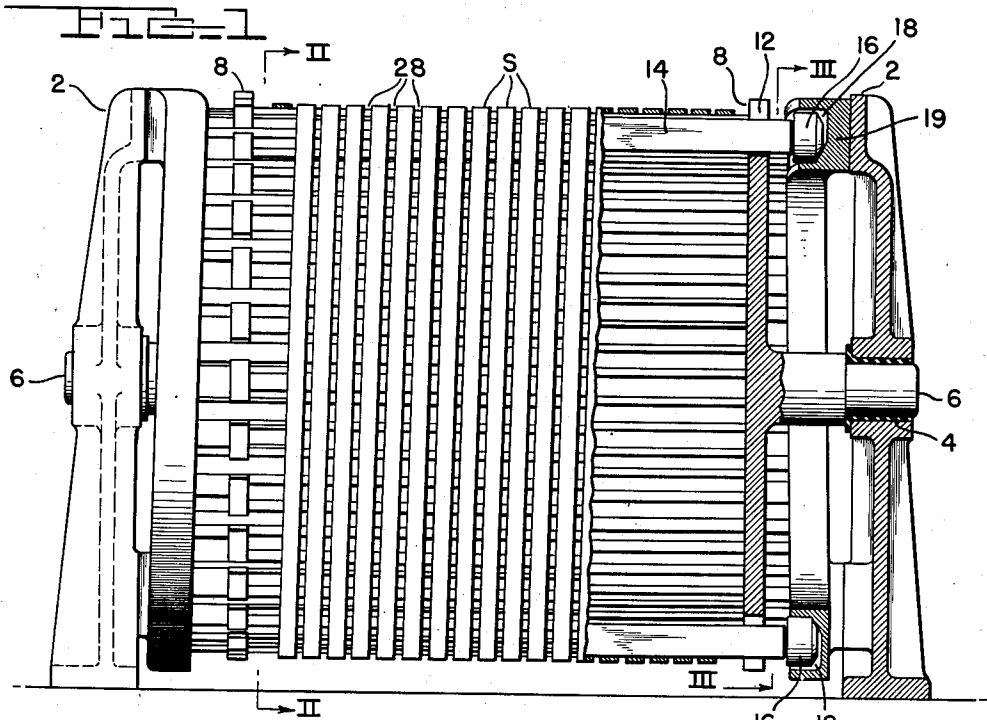
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2,654,139

CONTINUOUS STRAND HELICAL CONVEYING APPARATUS

Filed March 10, 1949

3 Sheets-Sheet 1



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FIG. 3

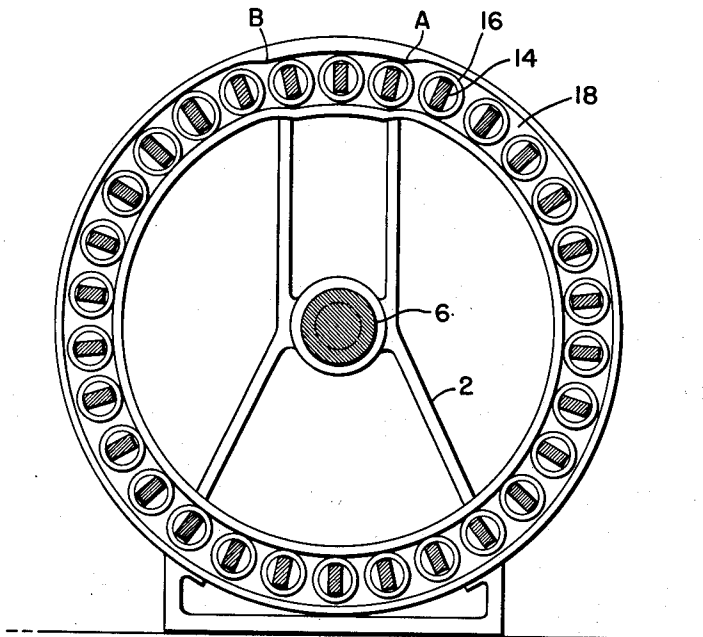


FIG. 4

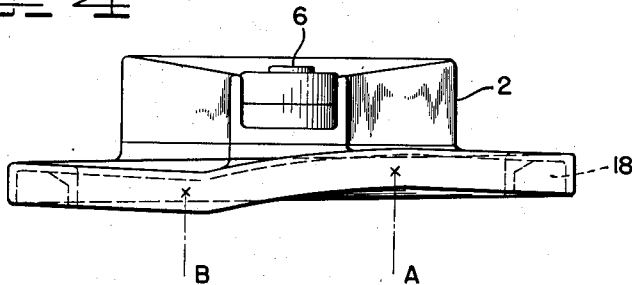
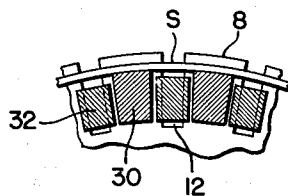


FIG. 5



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Fig. 7

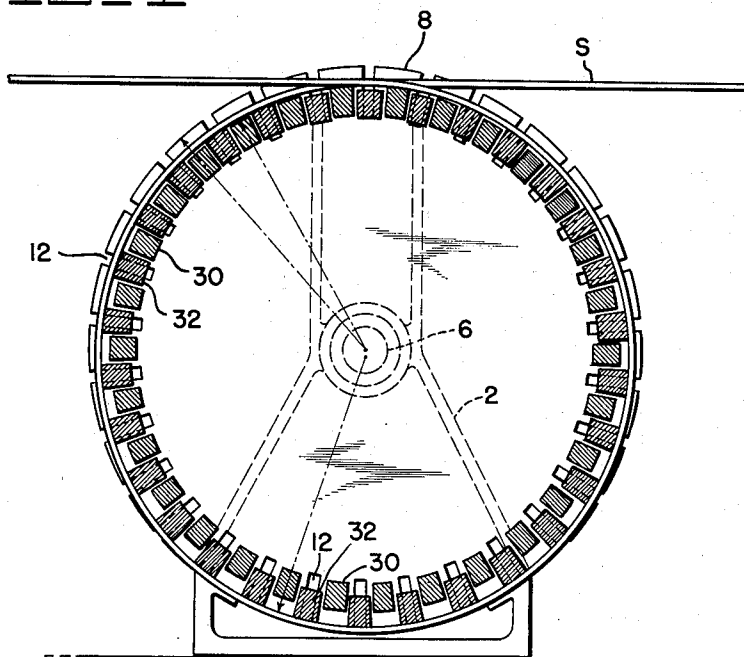


Fig. 5

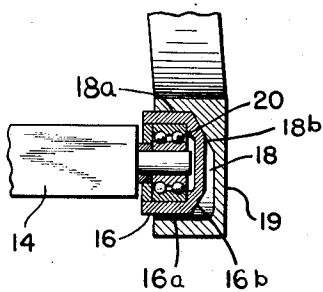


Fig. 8

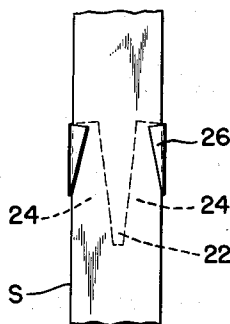
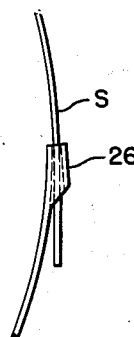


Fig. 9



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Application March 10, 1949; Serial No. 80,673

2 Claims. (Cl. 28—71.6)

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This invention relates to continuous strand helical conveying apparatus and more particularly to such apparatus for handling flat strip products. In the processing of flat strips in coil form, the processing equipment, such as continuous annealing furnaces, picklers, paint and enamel driers, must be extremely long if it is desired to process the strip rapidly. Since sufficient space is often not available for the equipment necessary to process the strip rapidly, the processing has been carried out at a much slower rate than desired. In order to decrease the amount of space now necessary, I have devised a helical conveyor which will permit leading a single continuous strand of strip onto the rotating reel body in the same relative constant position without lateral deviation at all times. In other words, each increment of strand width initially contacting the reel or deposited thereon, will do so at a point in a constant rotating plane perpendicular to the axis of the rotating reel. Somewhat similar types of reels have been used in the textile and related industries, but the problems in those industries are such that the reels which may be suitable for the textile industry will not be suitable for the handling of steel strip.

It is therefore an object of my invention to provide a reel or helical conveyor which will permit each helical convolution of the strip to be equally spaced across the body of the reel with a uniform distance between strand convolutions and in which there will be no slippage between the strip and the reel body.

This and other objects will be more apparent after referring to the following specification and attached drawings in which:

Figure 1 is a front view, partly in section, of the helical conveyor of my invention;

Figure 2 is a sectional view taken on the line II—II of Figure 1;

Figure 3 is a sectional view taken on the line III—III of Figure 1;

Figure 4 is a top plan view of one end of the conveyor showing the arrangement of the cam track;

Figure 5 is a sectional view of a detail of my invention;

Figures 6 and 7 show a slightly different modification of my invention;

Figure 8 is a view showing how the strip is fastened together; and

Figure 9 is a side view of Figure 8.

Referring more particularly to the drawings the reference numeral 2 indicates the housing at each end of the reel. Each housing 2 is provided

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with a bearing 4 for receiving a shaft 6. Mounted on each of the shafts 6 for movement therewith is a circular side plate 8. Extending between the side plates 8 and rigidly fastened thereto are ribs 10 which are equally spaced around the periphery thereof and which are the same radial distance from the center of rotation of the plates 8. The side plates 8 are provided with slots 12 located between the ribs 10. Located for sliding movement in each of the slots 12 is a non-rotatable bar or spline 14. Each end of each bar 14 extends through its associated slot 12 and is provided with a roller 16 which is received in a cam groove 18 in the housing 2. The cam groove 18 may be formed in a separate member 19 secured to the housing 2. The cam grooves 18 in the right and left hand housings 2 are complementary and are so shaped that the bars 14 will move both axially and radially. The cam groove 18 has a side portion 18a parallel to the axis of the reel and a beveled bottom portion 18b. Each of the rollers 16 has a cylindrical portion 16a adapted to engage the side portion 18a and a frusto conical portion 16b adapted to engage the beveled bottom portion 18b. The side portion 18a has a radially depressed portion between points A and B in a counterclockwise direction as seen in Figure 3. The beveled bottom portion 18b between points B and A (counterclockwise direction in Figure 3) is arranged at an angle or helix to a plane perpendicular to the axis of the reel to move the splines 14 axially from left to right as seen in Figure 1. Between points A and B (counterclockwise direction in Figure 3) the beveled bottom portion 18b is arranged at an oppositely extending angle to move the splines 14 rapidly in the opposite direction. As shown in Figure 5, the rollers 16 are supported on ball bearings 20 which take both radial and thrust loads. If desired, the plates 8 can be made integral with a cylindrical member which takes the place of bars 10 and the cylindrical member can be cut out to provide openings for the bars 14. In either case the structure will function in the same manner.

The operation of the device is as follows:

The strip S, to be conveyed helically across the face of the reel, approaches the reel at one end thereof adjacent the top as shown in Figure 2. To avoid the tendency for edge crinkling or over-stressing of the edge of the strip as it is fed on or off the helical reel, it should be fed onto and off the reel at a slight angle equal to the pitch of the spline segment actuating helical cam 18. The strip S is pulled around the reel at the entry side

and the end thereof is clamped loosely to the oncoming strip to form a complete circle around the drum. Sufficient back tension is applied to the entering strip to tighten up the circular band to produce friction between the band and the reel body. One way of fastening the strip together is shown in Figures 8 and 9. The end of the strip is split at 22 and spread apart as shown to form two forked sections 24. The end of each fork section is then bent around the incoming strip at 26 and the reel is rotated either manually or mechanically in case means are provided for driving the reel. At the point of entry of the strip S, the cam track 18 is depressed from points A to B, as shown on Figures 3 and 4, so that the strip will contact the outer periphery of the stationary bars 10 between these points. When the strip reaches point B, the cam track will have moved the bars 14 radially outwardly so that the outer surface thereof will be beyond the outer surface of the bars 10. Thus the strip will rest on the bars 14 between points B and A as seen in Figure 3. Also between points B and A the cam track 18 will move the bars 14 from left to right as seen in Figure 1 so that the strip S will be in the form of a helix. When the strip reaches point A, the bars 14 are depressed and the strip S will contact the bars 10. Between points A and B the cam track 18 will move the bars 14 from right to left back to their extreme left hand position. Thus, as rotation of the reel continues, the strip S is helically arranged from left to right as shown in Figure 1 with a space 28 between convolutions. There will be no sliding movement between the strip and the reel because each bar 14 in rotating around the reel from B to A is moved axially the same amount per degree of reel rotation, and therefore there is no danger of marring or scratching of the strip. In other words, the cam track between points B and A is helically formed at its base with the angle between the base and a plane perpendicular to the axis of reel rotation being the same at all points. Depending upon the application of the device, the reel will be rotated from a motor (not shown), or by the friction of the strip S as it is pulled from the reel.

As shown in Figures 6 and 7, wedge shaped ribs 30 may be used in place of ribs 10. The movable bars 32, which correspond to bars 14, may be made sufficiently wide to occupy practically the entire space between the ribs 30 so that there is practically no clearance between the ribs 30 and bars 32 at the outer surface.

While two embodiments of my invention have been shown and described it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. A rotatable helical conveyor reel for handling strip comprising a pair of spaced apart housings, a side plate rotatably supported by each housing, a plurality of spaced ribs having their opposite ends fastened to the periphery of the side plates so as to provide spaces therebetween, said plates having openings therein aligned with said spaces, a non-rotatable spline mounted in each space with its ends extending through the aligned openings in the side plates, each of said housings having a helically formed cam groove therein facing the opposite housing, each of said cam grooves having a side portion thereof par-

allel to the axis of the reel and a beveled bottom portion, a roller mounted on each end of each spline with its axis parallel to the reel axis and extending into the adjacent cam groove, each of said rollers having a cylindrical portion adapted to engage the said side portion of the cam groove and a frusto-conical portion adapted to engage said beveled bottom portion, the said side portion of each said cam grooves having a radially depressed portion whereby the outer surface of each of the movable splines is depressed below the outer surface of said ribs, the depressed portion of each of said cam grooves having the beveled bottom thereof arranged at an angle with a plane perpendicular to the axis of the reel to move the splines axially in one direction, and the major portion of each of said cam grooves having the beveled bottom thereof arranged at an angle with a plane perpendicular to the axis of the reel to move the splines axially in one direction, and the major portion of each of said cam grooves having the beveled bottom thereof arranged at an oppositely extending helix to move the splines axially an equal amount per increment of reel revolution in the opposite direction.

2. A rotatable helical conveyor reel for handling strip comprising a pair of spaced apart housings, a side plate rotatably supported by each housing, a plurality of spaced ribs having their opposite ends fastened to the periphery of the side plates so as to provide spaces therebetween, said plates having substantially rectangular openings therein aligned with said spaces, a substantially rectangular spline mounted in each space with its ends extending through the aligned openings in the side plates, each of said housings having a helically formed cam groove therein facing the opposite housing, each of said cam grooves having a side portion thereof parallel to the axis of the reel and a beveled bottom portion, a roller mounted on each end of each spline with its axis parallel to the reel axis and extending into the adjacent cam groove, each of said rollers having a cylindrical portion adapted to engage the said side portion of the cam groove and a frusto-conical portion adapted to engage said beveled bottom portion, the said side portion of each of said cam grooves having a radially depressed portion whereby the outer surface of each of the movable splines is depressed below the outer surface of said ribs, the depressed portion of each of said cam grooves having the beveled bottom thereof arranged at an angle with a plane perpendicular to the axis of the reel to move the splines axially in one direction, and the major portion of each of said cam grooves having the beveled bottom thereof arranged at an oppositely extending helix to move the splines axially an equal amount per increment of reel revolution in the opposite direction.

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