United States Patent

[11] 3,589,118

[72] Inventors **Alfred Strelow;**
Klaus Hascher, both of Berlin, Germany

[21] Appl. No. **843,687**
[22] Filed **July 22, 1969**
[45] Patented **June 29, 1971**
[73] Assignee **Siemens Aktiengesellschaft**
Berlin and Munich, Germany
[32] Priority **July 23, 1968**
[33] **Austria**
[31] **A7,116/68**

[54] **INTERMEDIATE STORER DISC FOR APPARATUS FOR STRANDING A TWISTED UNIT OF A CABLE**
6 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **57/34,** 57/59, 57/66
[51] **Int. Cl.** **D01h 7/02,** D07b 3/02, H01b 13/04
[50] **Field of Search** ..... 57/34, 34 AT, 59, 66, 66.5

[56] **References Cited**

UNITED STATES PATENTS

3,169,360	2/1970	Corrall et al.	57/34
3,373,550	3/1968	Symonds	57/34
3,412,544	11/1968	Sugi et al.	57/34
3,507,108	4/1965	Yoshimura et al.	57/34

Primary Examiner—John Petrakes
Attorneys—Curt M. Avery, Arthur E. Wilfond, Herbert L. Lerner and Daniel J. Tick

ABSTRACT: An intermediate pulloff disc in apparatus for stranding a twisted unit of a cable has a storage surface for the twisted unit and a plurality of grooves formed in such surface and extending in the direction of the axis of revolution for at least part of the altitude of such surface. A tumbling deflector ring has a plurality of spaced teeth extending therefrom and engaged in the grooves of the storage surface for displacing a section of twisted unit stored in such surface.

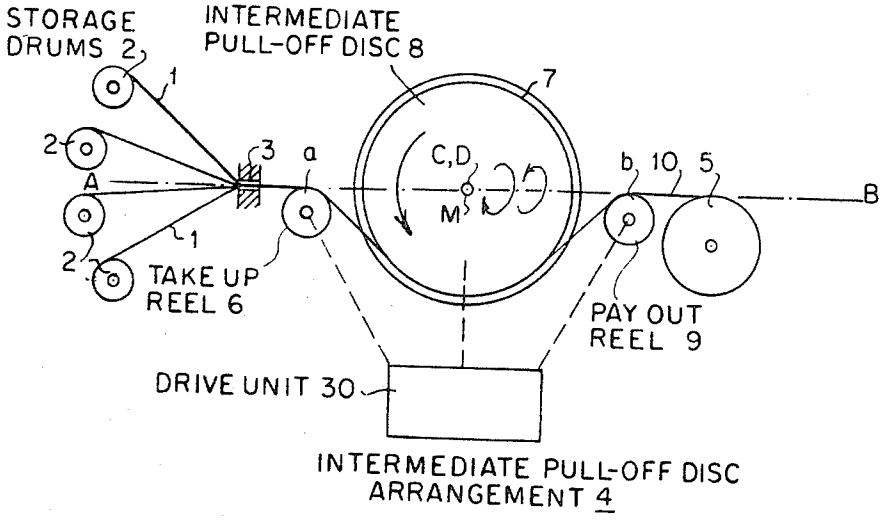


Fig. 1

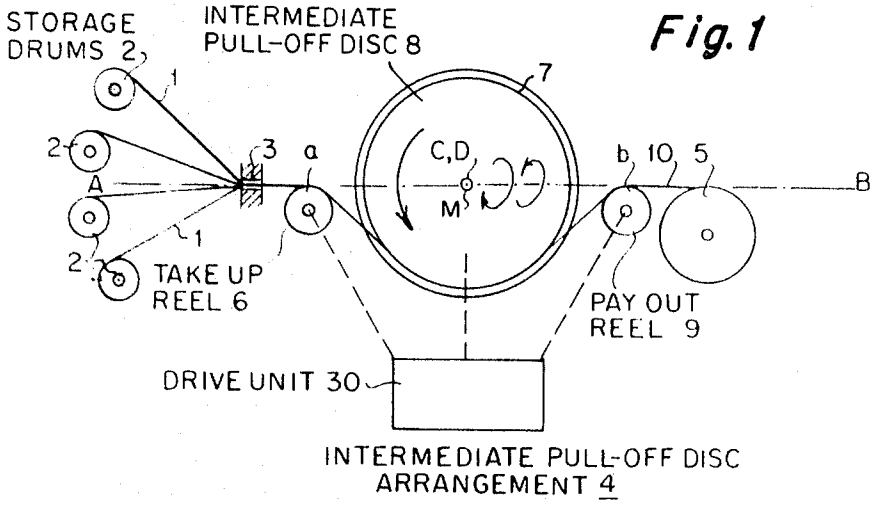


Fig. 5

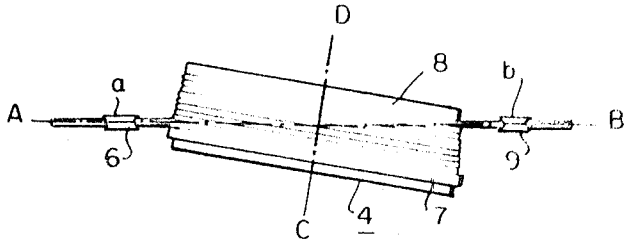
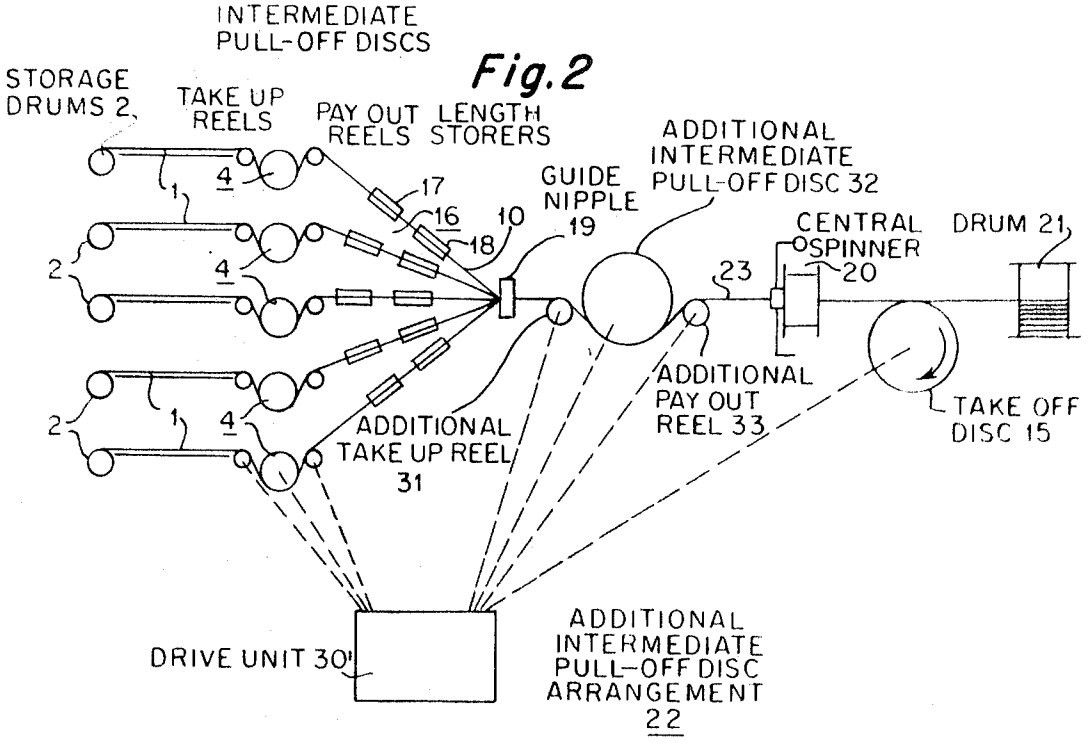


Fig. 2



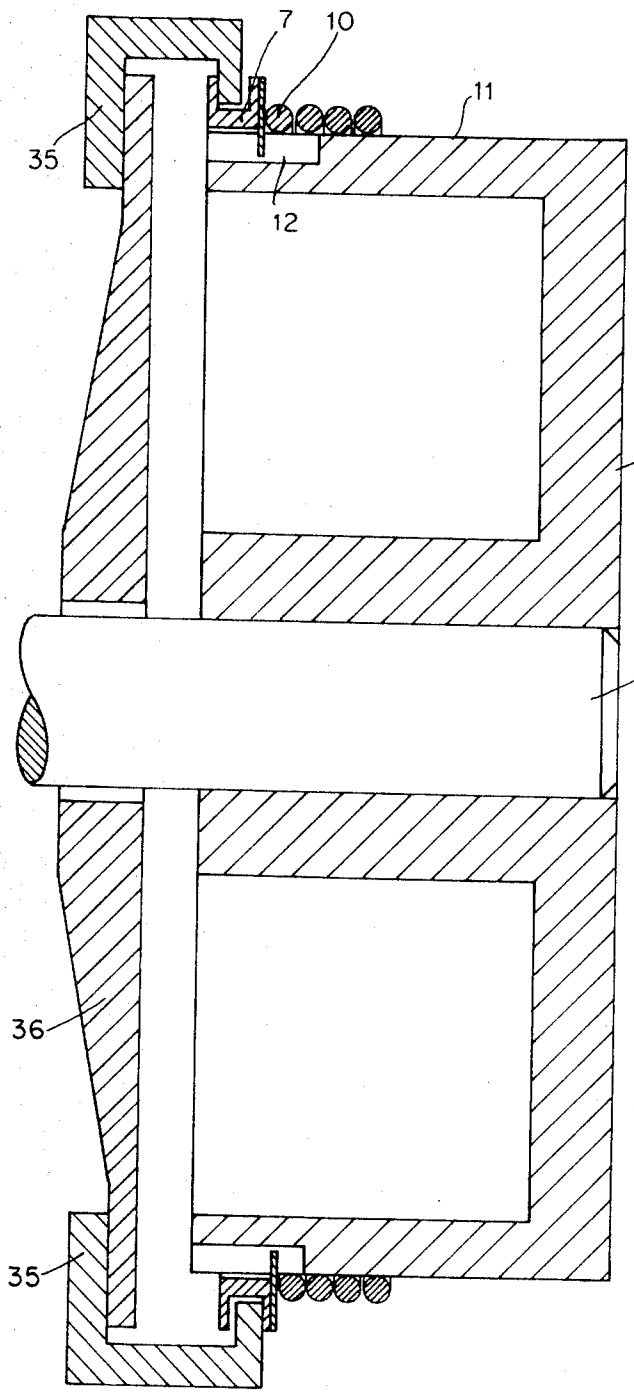


Fig.3

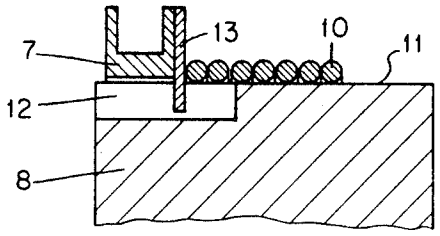


Fig.4

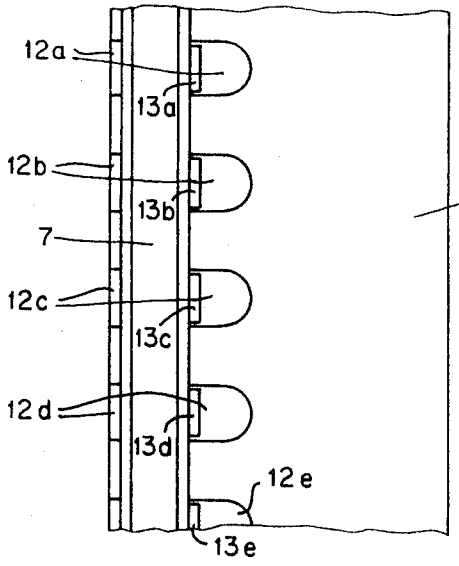


Fig.6

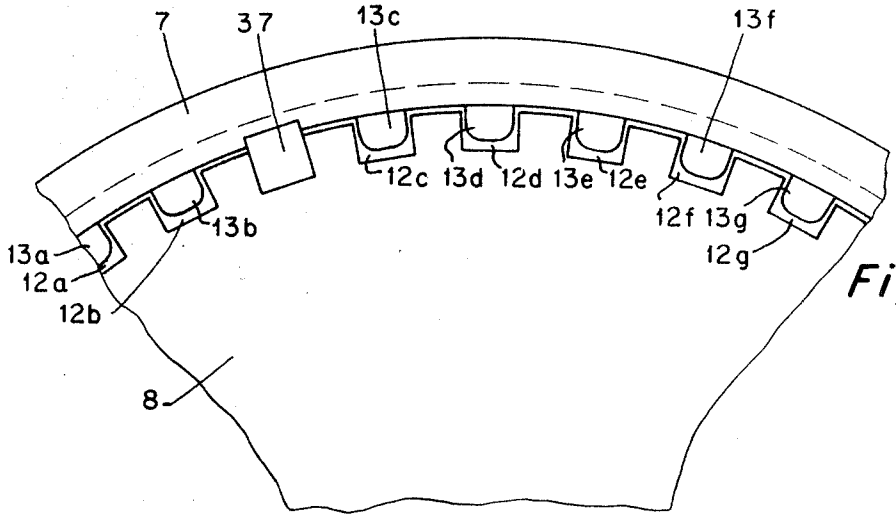


Fig.7

INTERMEDIATE STORER DISC FOR APPARATUS FOR STRANDING A TWISTED UNIT OF A CABLE

DESCRIPTION OF THE INVENTION

The present invention relates to apparatus for stranding a twisted unit of a cable. More particularly, the invention relates to an intermediate pulloff disc for apparatus for stranding a twisted unit of a cable.

The present production of communication cables is concerned with combining a plurality of stranding or twisting operations, which heretofore have been undertaken separately, in a single working operation in order to increase the efficiency and economy of production. The twisting or stranding operation involves the twisting or stranding of spiral or quad cables and modular bunching or combining of the twisted cables. In order to accomplish a single working operation, twisting devices are required which would enable the stranding of the twisted units previously stranded from a plurality of cable elements, in successive sections of length, alternating between a left hand or S-twist and a right hand or Z-twist. Stranding operations of this type, referred to as pendulum stranding or SZ stranding, have the advantage of permitting the elements to be twisted to be run off or removed from stationary takeup stands. Furthermore, further processing of a twisted unit produced by SZ twisting of the cable elements may be squarely effected during the same operation.

The devices previously utilized for SZ stranding generally utilize longitudinal storers or intermediate storers which provide a double function. The intermediate storers simultaneously function as takeup devices for the supplied incoming length section of the twisted unit and as payout devices for the removal of the outgoing length section. The direction of twisting is thereby alternated at intervals depending upon the length content of the intermediate storer. An intermediate storer is described, for example, in U.S. Pat. No. 3,169,360. The intermediate storer described in the aforementioned patent comprises a disc having a groove for guiding the twisted unit.

The production of communication cables requires apparatus which pulls the stranded elements or cable elements, or even the cable core through a cable producing machine such as, for example, a stranding or roping machine or a warm-type feed press. Pulling apparatus for stranding and cable producing machines, which pulls a cable, is disclosed in German Pat. No. 948,582. In the apparatus disclosed in the German patent, the wire rope or cable is wound on a storage or storer disc, in several turns, and is deflected upon said disc by a deflector ring mounted on said disc. The deflector ring tumbles on the storage surface of the storage disc.

It is of vital importance that during the pulling or drawing off of the twisted unit or stranded elements of the cable, utilizing the storage disc damage of the insulation of the wires of the stranded elements be prevented during the deflection of said elements on said storage disc. Since the inner diameter of the deflector ring is larger than the outer diameter of the storage disc, in order to enable said deflector ring to tumble upon the storage surface of said storage disc, an annular slot, gap or space is provided between said deflector ring and said storage disc. The very thin stranded elements of the twisted unit or cable have a tendency to become clamped in such space between the deflector ring and the storage disc during the process of deflection on the storage surface of said storage disc. This results in damage to the insulation on the stranded elements.

The principal object of the present invention is to provide a new and improved apparatus for stranding a twisted unit of a cable.

An object of the present invention is to provide apparatus for stranding a twisted unit of a cable in different directions of stranding.

An object of the present invention is to provide a new and improved intermediate pulloff or storer disc for apparatus for stranding a twisted unit of a cable.

An object of the present invention is to provide a new and improved storer disc for apparatus for stranding a twisted unit of a cable.

An object of the present invention is to provide a storer disc which prevents damage to the insulation of the stranding elements of a twisted unit of apparatus for stranding a twisted unit of a cable.

An object of the present invention is to provide an intermediate storer disc for apparatus for stranding a twisted unit of a cable, which intermediate storer disc functions with efficiency, effectiveness and reliability.

An object of the present invention is to provide an intermediate storer disc for apparatus for stranding a twisted unit of a cable, which intermediate storer disc is economical in production and operation.

An object of the present invention is to provide an intermediate storer disc for apparatus for stranding a twisted unit of a cable, which intermediate storer disc insures a reliable supply to and removal from the intermediate storer of the twisted unit.

An object of the present invention is to provide an intermediate storer disc for apparatus for stranding a twisted unit of a cable, which intermediate storer disc prevents clamping of stranding elements between a deflector ring and the storage surface of the disc.

In accordance with the present invention, the intermediate storer disc has a storage surface for the twisted unit, an altitude, an axis of revolution and a plurality of spaced grooves formed in the storage surface of the disc and extending in the direction of the axis of revolution for at least part of the altitude of the storage surface. A tumbling deflector ring has teeth extending therefrom and engaged in the grooves of the storage surface. The tumbling deflector ring displaces the section of the twisted unit stored on the storage surface. The deflector ring continually displaces the turns of the twisted units stored on the storage surface of the intermediate storer disc, so that subsequent turns may be taken up by said intermediate storer disc without superposition on the turns already stored. This may result in damage to the insulation of the wire. This type of damage cannot occur on the intermediate storer disc of the present invention. The deflector ring on the storage surface of the storer disc is in comblike engagement with such storage surface and thereby prevents the clamping of stranding elements between the deflector ring and the storer disc, so that such damage is Prevented.

The grooves are equidistantly spaced from each other. The distance between next-adjacent grooves is equal to the width of a groove. This provides the maximum engagement area for the stranding or stranded elements at the deflector ring, and at the same time provides the maximum engagement area for the stranded or stranding elements on the storer disc.

The teeth of the deflector ring are equidistantly spaced from each other. Each of the teeth is engaged in a corresponding one of the grooves.

The storage surface of the disc is of cylindrical configuration and the deflector ring is of annular configuration. In order that the present invention may be readily carried into effect, it will now be described with reference to the accompanying drawings, wherein:

FIG. 1, which is FIG. 1 of copending U.S. Patent application, Ser. No. 843,664 filed July 22, 1969, is a schematic diagram of an embodiment of the apparatus of the present invention;

FIG. 2, which is FIG. 6 of copending U.S. Pat. application, Ser. No. 843,664, filed July 22, 1969, is a schematic diagram of a modification of the apparatus of FIG. 1 of the present invention;

FIG. 3 is a diametrical sectional view of an embodiment of the intermediate pulloff disc of the present invention;

FIG. 4 is a radial sectional view of part of an embodiment of the intermediate pulloff disc of the present invention;

FIG. 5, which is FIG. 2 of a copending U.S. Pat. application, Ser. No. 843,664 filed July 22, 1969, is a top view of an embodiment of the intermediate pulloff disc of the present invention with a twisted unit thereon;

FIG. 6 is a top view of an embodiment of the intermediate pulloff disc of the present invention without a twisted unit thereon; and

FIG. 7 is a side view of the embodiment of FIG. 6 of the intermediate pulloff disc of the present invention.

In the FIGS. the same components are identified by the same reference numerals.

As disclosed in pending U.S. Pat. application, Ser. No. 843,664 filed July 22, 1969, the apparatus of FIG. 1 twists a plurality of stranding or cable elements into a twisted unit, the twisting direction of which changes for each section of length. Thus, for example, in FIG. 1 four cable elements or wires are twisted into a spiral quad. In FIG. 1, the cable elements 1 are supplied from storage drums 2 to a nipple 3. The nipple 3 combines the cable elements 1 and supplies them to an intermediate storer arrangement 4. The twisted unit removed from the intermediate storer arrangement 4 is then wound on the drum 5.

The cable elements from the nipple 3 are supplied to a takeup reel 6 of the intermediate pulloff or storer arrangement 4. The takeup reel 6 supplies the twisted unit formed by the takeup reel 6 to the intermediate storer disc 8 of the intermediate storer arrangement 4. The intermediate storer disc 8 has a tumbling deflector ring 7 mounted thereon. The twisted unit is removed from the intermediate storer disc 8 to a payout reel 9. The intermediate storer disc 8 may be rotated in a counterclockwise direction, as indicated by the single arrow, about an axis C–D, passing through the center M of said disc. The intermediate storer disc 8 is driven about the axis C–D by the twisted unit wound on its storage surface (FIGS. 4 and 5).

The intermediate storer arrangement 4, which comprises the takeup reel 6, the intermediate storer disc 8 and the payout reel 9, is rotatable about an axis of rotation A–B, in both clockwise and counterclockwise directions, as indicated by the pair of arrows in FIG. 1. During the stranding of the cable elements 1 to form the twisted unit 10, said elements are twisted in a specific direction while they are being taken up by the takeup reel 6 at a point *a*. The intermediate storer arrangement 4 rotates about its axis of rotation A–B and periodically changes its direction of rotation. The twisted unit is then supplied by the takeup reel 6 to the intermediate storer disc 8 and is wound a plurality of times on said disc in accordance with the desired position of a section of length of said twisted unit. Each section of length of the twisted unit has the same direction of twist or twist direction.

The number of windings of the twisted unit on the intermediate storer disc 8 varies in accordance with the capacity of the intermediate storer arrangement 4, which depends upon the length of a section of said twisted unit, twisted in the same direction. When the full capacity of the intermediate storer arrangement 4 is utilized by a length section of the twisted unit, twisted in the same direction, the direction of rotation of said intermediate storer arrangement is reversed. As a result of the reversal of the direction of rotation, the twisted unit is removed to a point *b*, where the payout reel 9 is positioned, with an additional twist in the same direction, during the runoff of said twisted unit from the intermediate storer disc 8. The payout reel 9 superimposes the additional twist on the initial twist.

Simultaneously with the removal of the twisted unit to the payout reel 9, a new length section of twisted unit is supplied to the intermediate storer arrangement 4 and is stranded with a twist in the opposite direction. When the full capacity of the intermediate storer arrangement 4 is utilized by the new length section, the direction of rotation of said intermediate storer arrangement is again reversed, so that said new length section is also provided with an additional twist in the same direction, during its removal from the intermediate storer disc 8. The additional twist is superimposed upon the next-preceding twist. In this manner, the twisted or cable elements 1 are alternately provided in sections of length with two opposite twists of equal magnitude.

In order to prevent the necessity for reversing the direction of rotation of the intermediate storer arrangement 4, said intermediate storer arrangement must have a maximum storage capacity. The maximum storage capacity is provided in the apparatus of the present invention by winding the twisted unit on the storage surface of the intermediate storer disc 8 in a plurality of adjacent turns (FIGS. 4 and 5). The intermediate storer disc 8 may, for example, be of I cross-sectional configuration. The storage surface of the disc is the cylindrical peripheral outer surface.

The turn of the twisted unit supplied to the intermediate storer disc 8 and the turn of said twisted unit removed from said disc are mutually displaced relative to a plane perpendicular to the axis C–D (FIG. 5). Thus, rotation of the intermediate storer disc 8 about the axis of rotation A–B perpendicular to the axis C–D would produce a rotary movement of the supplied portion of the twisted unit, including the takeup reel 6, and the removed portion of said twisted unit, including the payout reel 9, about said axis of rotation. This would result in supplying the twisted elements or cable elements and in taking up or supplying and removing or running off the twisted unit to or from the intermediate storer disc 8.

As shown in FIG. 5, the axis of rotation A–B of the intermediate storer arrangement 4 is so selected that the takeup reel 6 is positioned at the takeup point *a* and the payout reel 9 is positioned at the payout point *b* on said axis of rotation. The twisted unit is supplied by the takeup reel 6 to the intermediate storer disc 8 in the direction of the axis of rotation A–B and said twisted unit is removed from said intermediate storer to the payout reel 9 in said direction. This results in a satisfactory and protected supply system for the cable elements 1 to the intermediate storer arrangement 4. The dimensions of the intermediate storer disc 8 are such that its axis C–D and its axis of rotation A–B are at an angle of less than 90° with each other (FIG. 5).

In a modification of the embodiment of FIG. 1 of the present invention, apparatus for stranding cable elements, particularly communication cables, comprises a plurality of systems of the type shown in FIG. 1. The systems operate in parallel with each other and each corresponds to the embodiment of FIG. 1. An additional intermediate storer arrangement operates in series with the plurality of intermediate storer arrangements to twist the resultant twisted unit supplied by said plurality of intermediate storer arrangements. It is thus possible to combine two stranding or twisting processes in the same working operation. The stranding or twisting apparatus which is connected in series with the plurality of intermediate storer arrangements, may, in accordance with the present invention, comprise a rotating additional takeup reel for stranding the resultant twisted unit from said intermediate storer arrangements in a stranding nipple. An additional intermediate storer and an additional payout reel are also provided and function together with the additional takeup reel as the additional intermediate storer.

It is especially preferable that the supply to and removal from the additional intermediate storer arrangement of the resultant twisted unit have the same speed relation to the speed of rotation of the intermediate storer arrangements as in the embodiment of FIG. 1.

As described in copending U.S. Pat. application, Ser. No. 843,664 filed July 22, 1969, FIG. 2 illustrates the modification of the embodiment of FIG. 1, wherein a plurality of intermediate storer arrangements 4 are provided in a manner whereby they operate in parallel. An additional intermediate storer arrangement 22 is provided in a manner whereby it operates in series with the parallel-connected intermediate storer arrangements 4 to strand or twist the resultant twisted unit provided by said parallel-connected intermediate storer arrangements.

In FIG. 2, five intermediate storer arrangements 4 are illustrated. In each of the apparatus for the intermediate storer arrangements 4, communication cable elements or wires 1 are supplied by a storage drum 2 to the corresponding immediate storer arrangement. Each of the intermediate storer arrangements 4 produces a spiral quad 10 simultaneously with the

others. The twisted units or spiral quads **10** are combined to a resultant twisted unit by the additional takeup reel **31**. The resultant twisted unit is then twisted into modular bunches or units **23** by the additional intermediate storer arrangement **22**. The speed of removal of the twisted, twisted unit **23** from the additional intermediate storer arrangement **22** is determined by the speed of rotation of a takeoff disc **15**.

Each of the intermediate storer arrangements **4** periodically alternates its direction of rotation and therefore its direction of twisting. When they are combined to form the resultant twisted unit, the individual twisted units **10** are stranded together in a specific direction. Preferably, the speed of rotation and, if necessary, the direction of rotation, of the intermediate storer arrangements **4** are made to vary. This provides electrical decoupling of the twisted unit or spiral quad **10** which is a component of the twisted, twisted unit or modular bunch **23**. When an intermediate storer arrangement **4** is filled to capacity with a section of length of twisted unit having the same direction of twisting, the direction of rotation of such intermediate storer arrangement is reversed. The intermediate storer arrangements **4** rotate in the same direction, so that they are reversed in direction at the same time.

As a result of the change in direction of the rotation of the intermediate storer arrangements **4**, the twisted units **10** are provided with an additional twist, in the same direction, which is superimposed upon the initial twist provided prior thereto during the supply of the twisted unit to the intermediate storer arrangement. Simultaneously, new sections of twisted units are supplied to the intermediate storer arrangements **4** and are twisted in the opposite direction. When the intermediate storer arrangements **4** are filled to capacity with the new sections of length of twisted units, the direction of rotation of said intermediate storer arrangements is again reversed, so that such new sections are also provided, during their runoff from the intermediate storer arrangements, with an additional twist, in the same direction, which is superimposed upon the preceding twist. In this manner the twisted units or spiral quads are alternately provided, in length sections, with two opposite twists of equal magnitude.

After the twisted unit **10** is provided by an intermediate storer arrangement **4**, said twisted unit is supplied to a corresponding longitudinal or length storer **16**. Each length storer **16** comprises two deflection rollers **17** and **18** positioned in sequence. The individual twisted units are wound on the deflection rollers **17** and **18** at different rates. Therefore, each of the twisted units **10** has a different path length in its extension from the corresponding intermediate storer arrangement **4** to a guide nipple **19**. This results in the points of the individual twisted unit at which the direction of twist alternates, being nonadjacent following the twisting of the resultant twisted unit into the twisted, twisted unit **23** . These points are mutually displaced.

After the five twisted units **10** are provided by the corresponding length storers **16**, they are supplied, via the guide nipple **19** which combines them into the resultant twisted unit, to the additional intermediate storer arrangement **22**. The additional intermediate storer arrangement **22** is the same as each of the intermediate storer arrangements **4** and comprises the additional takeup reel **31**, an additional intermediate storer **32** and the additional payout reel **33**. The additional intermediate storer arrangement rotates at a speed in accordance with the twisting which is customary in producing stranding or twisted, twisted units or modular bunches. The additional intermediate storer arrangement **22** operates in the same manner as each of the intermediate storer arrangements **4**. The twisted, twisted unit **23** is thus alternately provided in sections of length with twists of the same magnitude in opposite directions.

The twisted, twisted unit **23** is supplied to a central spinner **20** which functions to provide the SZ twisted, twisted unit with a helical marker. The twisted, twisted unit **23** is then wound on a takeoff disc **15** and a drum **21**. The takeoff disc **15** rotates in clockwise direction, as indicated by the arrow.

The speed of rotation of the takeoff disc **15** determines an equally high supply and removal speed for the twisted units relative to the intermediate storer arrangements **4**. The supply and removal speeds are determined in a manner whereby they are proportional to the speed of rotation of the intermediate storer arrangements **4**. Thus, every variation in the speed of rotation of the intermediate storer arrangements **4** and the additional storer arrangement **22** occurs at the same instant. Furthermore, the speed of rotation of each intermediate storer arrangement **4** and the additional intermediate storer arrangement **22** has a constant relationship to the speed of rotation of every other intermediate storer arrangement at any instant. This enables each of the intermediate storer arrangements **4**, the additional intermediate storer arrangement **22** and the takeoff disc **15** to be driven by a drive unit **30'** , essentially similar to the drive unit **30** of FIG. **1**. The drive unit **30'** may comprise any suitable driving arrangement, which may operate from a single drive source, for driving the takeup reels, payout reels and intermediate storers of the intermediate storer arrangements at the desired speeds and for rotating the takeoff disc **15** at the desired speed.

In actual operation of the apparatus of FIG. **2**, we found it expedient to select the length of a section of the twisted unit, having the same direction of twist, as 20 meters. Each of the intermediate storer arrangements **4** was rotated at an average speed of 500 r.p.m. The additional intermediate storer arrangement **22** was rotated at approximately 170 r.p.m. The twisted, twisted unit was produced at the rate of approximately 50 meters-per-minute.

As shown in FIG. **3**, the storer or storage disc **8** is tightly affixed to a rotatable shaft **34**. The section of length of the twisted unit taken up by or supplied to the intermediate storer disc **8** must be continuously displaced or shifted on the storage surface **11** thereof, as shown in FIGS. **4** and **5**, in order to provide space for the successively supplied sections of said twisted unit. A deflector ring or tumbling deflector ring **7** is utilized to provide such continuous displacement or shifting. The deflector ring **7**, as shown in FIGS. **3**, **4**, **6** and **7**, is so positioned that it provides a tumbling movement of the twisted unit **10** relative to the intermediate storer disc **8**. A specific distance must be provided between the deflector ring **7** and the storage surface **11** of the intermediate storer or storage disc **8**, in order to enable said deflector ring to tumble on said storage disc.

The tumbling or tumbling movement of the deflector ring **7** is produced by a plurality of slider members **35**, as shown in FIG. **3**, which are firmly affixed to a stationary carrier disc **36**. The carrier disc **36** is coaxially mounted around the shaft **34**, but is not affixed to said shaft and is not affected by rotation of said shaft. The slider members **35** are of substantially U-shaped cross-sectional configuration and engage the deflector ring **7**, due to the fact that the deflector ring is also of substantially U-shaped cross-sectional configuration opening outward from the storage surface **11**, as shown in FIGS. **3** and **4**. Corresponding arms of the slider members **35** thus cooperate with the corresponding arm of the deflector ring **7**, as shown in FIG. **3**, and are mutually displaced in the axial direction of the shaft **34**, which axial direction is also that of the storer disc **8**. Thus, upon rotation of the storer disc about its axis, the deflector ring **7** moves back and forth on the storage surface **11** of said storer disc, in axial directions.

In order to prevent the twisted elements or cable elements **1** of the twisted unit **10** such as, for example, the wires of a spiral quad, from becoming clamped in the space between the deflector ring **7** and the storage surface **11** of the intermediate storer disc **8**, which clamping could damage the insulation of said wires, said storage surface **11** has a plurality of grooves **12** formed therein. The grooves **12** extend in directions parallel to the axis C–D of the intermediate storer disc **8** and are equidistantly spaced around the storage surface **11**. Each of the grooves **12** extends for at least part of the altitude of the storage surface **11**. The deflector ring **7** has a plurality of teeth **13** extending therefrom. The teeth **13** of the deflector ring **7**

are engaged in the grooves 12, which grip said teeth. Thus, as shown in FIGS. 6 and 7, each of the teeth 13*a*, 13*b*, 13*c*, 13*d*, and so on, is engaged in a corresponding one of the grooves 12*a*, 12*b*, 12*c* 12*d*, and so on.

The deflector ring 7 is thus affixed to the storage surface 11 of the intermediate storer disc 8 in the manner of a comb, in the area wherein the twisted unit is displaced or shifted by said deflector ring. The stranded or cable elements of the twisted unit 10 are thus prevented from being clamped between the deflector ring 7 and the storage surface 11. The distance between next-adjacent grooves 12 is preferably equal to the width of a groove. This provides a good bearing for the twisted unit on the storage surface 11 and a good bearing of said twisted unit against the deflector ring. The engagement of the teeth 13 in the grooves 12 prevents the individual wires of the spiral quad or twisted unit from becoming clamped between the deflector ring 7 and the storage surface 11 of the storer disc 8. This, as hereinbefore described, prevents damage to the insulation of the individual wires.

The tumbling deflector ring 7 may be mounted on the storer disc 8 by a plurality of slide members 37, as shown in FIG. 7. The slide members 37, only one of which is shown in FIG. 7, are equidistantly distributed around the periphery of the storer disc 8. The slide members 37 are affixed to the storer disc 8 and extend therefrom, beyond the storage surface 11 thereof. The slide members 37 provide a concentric seat for the deflector ring 7 on the storer disc 8.

The teeth 13 of the deflector ring 7 do not contact the storer disc 8 in the grooves 12. It is possible to construct some of the teeth as sliding members. Such teeth would , as the other teeth, extend from the deflector ring 7 and would be engaged in corresponding ones of the grooves 12.

While the invention has been described by means of specific examples and in specific embodiments, we do not wish to be limited thereto, for obvious modifications will occur to those skilled in the art without departing from the spirit and scope of the invention.

We claim:

1. In apparatus for stranding a twisted unit of a cable in different directions of stranding, an intermediate pulloff disc comprising

a storage surface for the twisted unit having an altitude, an axis of revolution and a plurality of spaced grooves formed in the storage surface of said disc and extending in the direction of the axis of revolution for at least part of the altitude of said storage surface; and

a tumbling deflector ring having a plurality of spaced teeth extending therefrom and engaged in the grooves of said storage surface for displacing a section of twisted unit stored on said storage surface.

2. An intermediate pulloff disc as claimed in claim 1, wherein said grooves are equidistantly spaced from each other, the distance between next-adjacent grooves being equal to the width of a groove.

3. An intermediate pulloff disc as claimed in claim 1, wherein the teeth of said deflector ring are equidistantly spaced from each other and each of said teeth is engaged in a corresponding one of said grooves.

4. An intermediate pulloff disc as claimed in claim 1, wherein said storage surface is of cylindrical configuration and said deflector ring is of annular configuration.

5. Apparatus for stranding a twisted unit of a cable in different directions of stranding, comprising

a plurality of cable elements;

a takeup point for forming a twisted unit from said cable elements;

a payout point; and

intermediate pulloff means positioned between said takeup point and said payout point engaging said twisted unit, said intermediate pulloff means rotating said twisted unit about an axis of rotation a number of twists between said takeup point and said payout point and providing a different direction of stranding of the twisted unit for individual section lengths, said intermediate pulloff means comprising an intermediate pulloff disc having a storage surface for the twisted unit, an axis of revolution, a plurality of spaced grooves formed in the storage surface of said disc and extending in the direction of said axis of revolution for at least part of the altitude of said storage surface and a tumbling deflector ring having a plurality of spaced teeth extending therefrom and engaged in the grooves of said storage surface for displacing the section of the twisted unit stored on said storage surface, a takeup reel at the takeup point for supplying the twisted unit to the storage surface of said pulloff disc in the direction of the axis of rotation of said intermediate pulloff means and a payout reel at the payout point and on the axis of rotation of said intermediate pulloff means for removing the twisted unit from the storage surface of said pulloff disc in the direction of said axis of rotation.

6. Apparatus for stranding a twisted unit of a cable in different directions of stranding, comprising

a plurality of groups of cable elements;

a plurality of takeup points each for forming a twisted unit from the cable elements of a corresponding one of said groups of cable elements;

a plurality of payout points each cooperating with a corresponding one of said takeup points;

a plurality of parallel-operating intermediate pulloff means each positioned between a corresponding cooperating takeup point and payout point and engaging a corresponding twisted unit, each of said intermediate pulloff means rotating the corresponding twisted unit about an axis of rotation a number of twists between the corresponding takeup point and the corresponding payout point and providing a different direction of stranding of the corresponding twisted unit for individual section lengths, each of said intermediate pulloff means comprising an intermediate pulloff disc having a storage surface for the twisted unit, an axis of revolution, a plurality of spaced grooves formed in the storage surface of said disc and extending in the direction of said axis of revolution for at least part of the altitude of said storage surface and a tumbling deflector ring having a plurality of spaced teeth extending therefrom and engaged in the grooves of said storage surface for displacing the section of the twisted unit stored on said storage surface, a takeup reel at the corresponding takeup point for supplying the corresponding twisted unit to the storage surface of said pulloff disc in the direction of the axis of rotation of said intermediate pulloff means and a payout reel at the corresponding payout point and on the axis of rotation of said intermediate pulloff means for removing the corresponding twisted unit from the storage surface or said pulloff disc in the direction of said axis of rotation;

an additional takeup point for forming a resultant twisted unit from the twisted units of said plurality of intermediate pulloff means;

an additional payout point; and

additional intermediate pulloff means operating in series with said plurality of intermediate pulloff means positioned between the additional takeup point and the additional payout point and engaging the resultant twisted unit, said additional intermediate pulloff means comprising an additional intermediate pulloff disc having a storage surface for the resultant twisted unit, an axis of revolution, a plurality of spaced grooves formed in the storage surface of said disc and extending in the direction of said axis of revolution for at least part of the altitude of said storage surface and a tumbling deflector ring having a plurality of spaced teeth extending therefrom and engaged in the grooves of said storage surface for displacing the section of the resultant twisted unit stored on said storage surface, an additional takeup reel at the additional takeup point for supplying the resultant twisted unit to said additional intermediate pulloff means in the

direction of the axis of rotation of said additional intermediate storer and an additional payout reel at the additional payout point and on the axis of rotation of said additional intermediate pulloff means for removing the resultant twisted unit from said additional intermediate pulloff means in the direction of said axis of rotation.