United States Patent [19]

Asbeck et al.

[11] **3,724,249**

[45] **Apr. 3, 1973**

[54] **METHOD OF AND DEVICE FOR THE COILING OF METAL TAPE OR STRIP**

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[21] Appl. No.: **120,100**

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Nov. 6, 1970 Germany .... P 20 54 595.3

[52] **U.S. Cl.** **72/146,** 72/196
[51] **Int. Cl.** **B21d 19/00**
[58] **Field of Search** 72/187, 196, 146, 147

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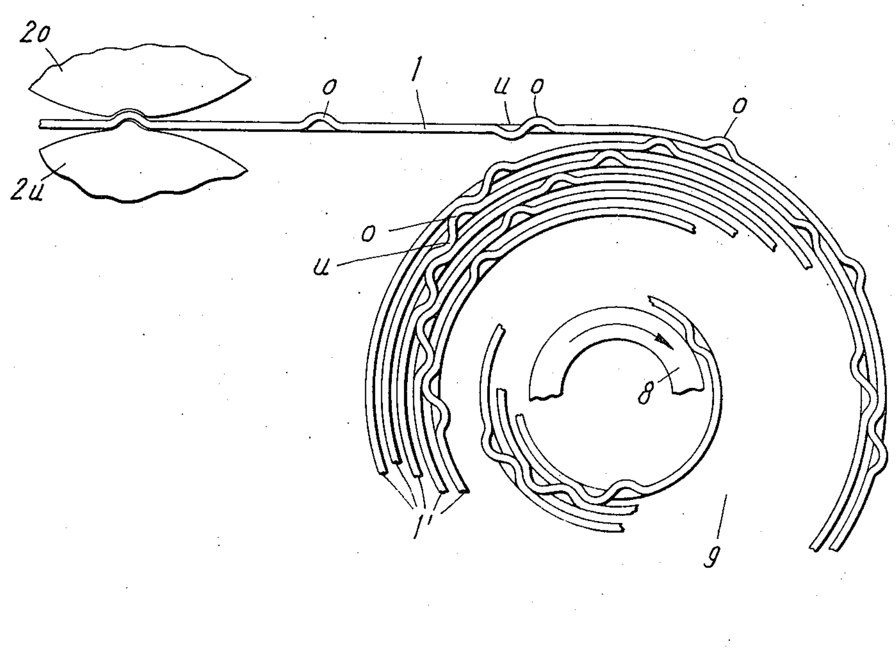
Primary Examiner—Lowell A. Larson
Attorney—Kenwood Ross and Chester E. Flavin

[57] **ABSTRACT**

A method of coiling metal tape with spaced convolutions, whereby both rims of the tape are deformed, characterized in that the tape is wound on a horizontal axis and is provided at its edges with deformations arranged so that deformations in adjacent convolutions interlock to prevent relative tangential and/or axial movement between said convolutions, and a device for carrying out the method and for manufacturing tape edge deformations acting in a manner to interlock adjacent convolutions in a coil of tape wound on a horizontal axis whereby tool equipped tool holders rotatable into a working position are provided on the periphery of a pair of disc-bodies arranged respectively on opposite sides of the tape edge.

20 Claims, 25 Drawing Figures



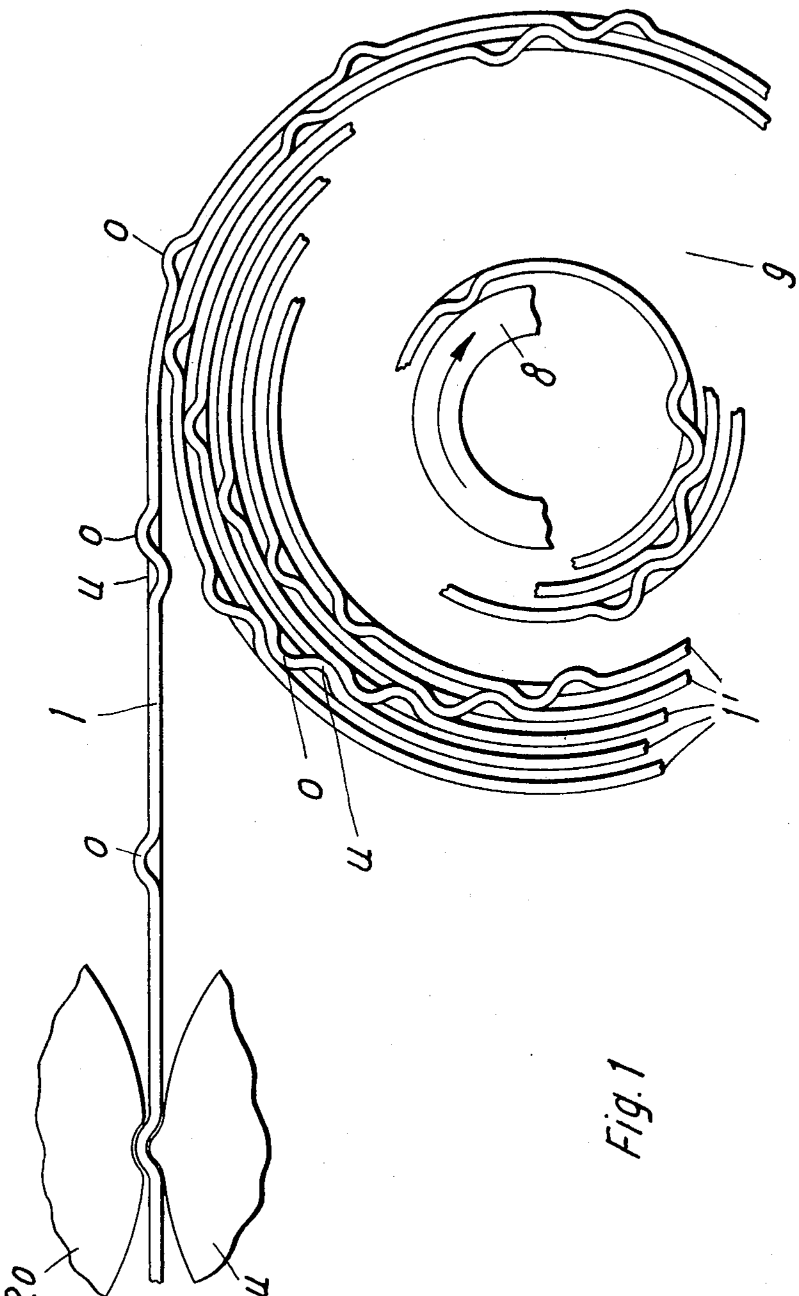


Fig. 1

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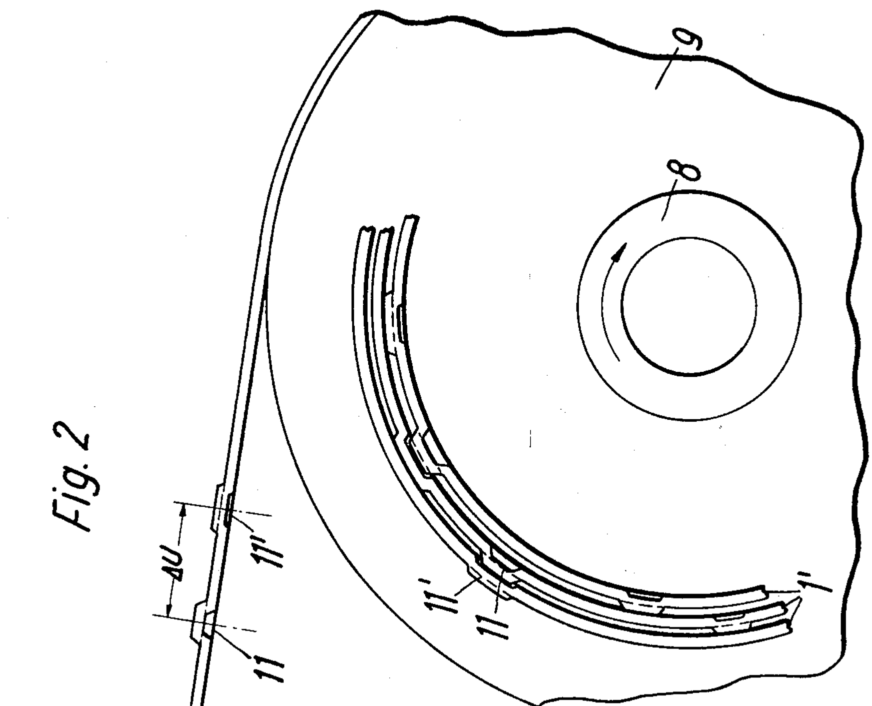

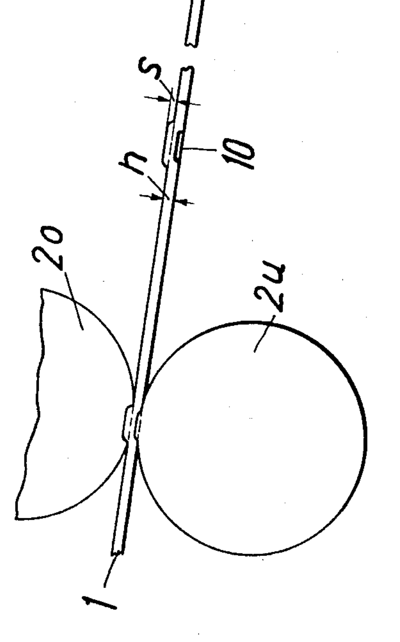

Fig. 2

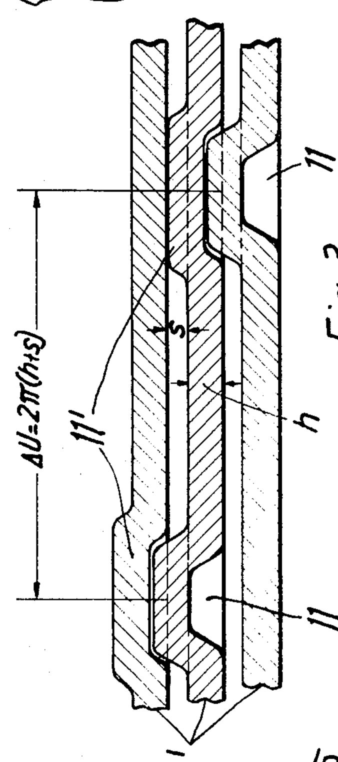

Fig. 3

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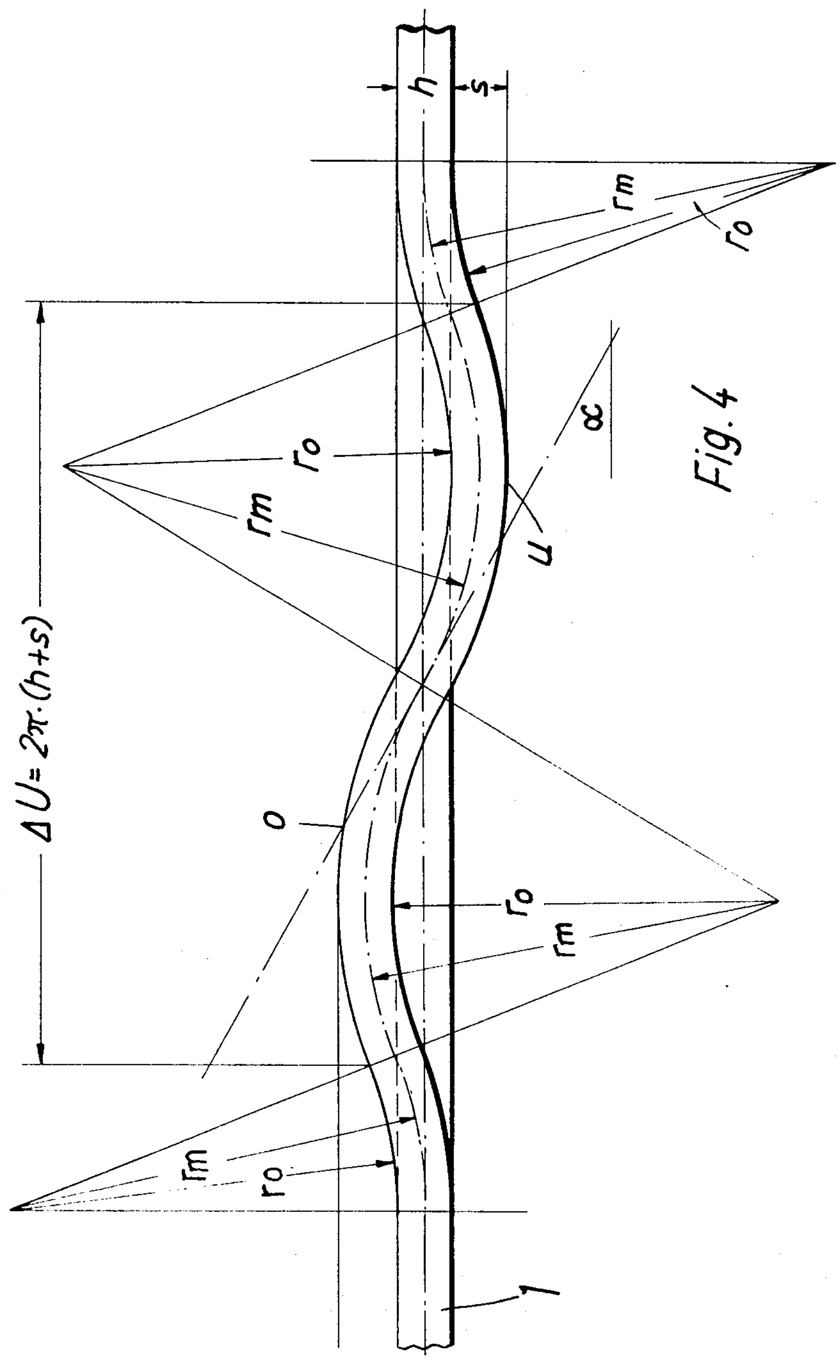

Fig. 4

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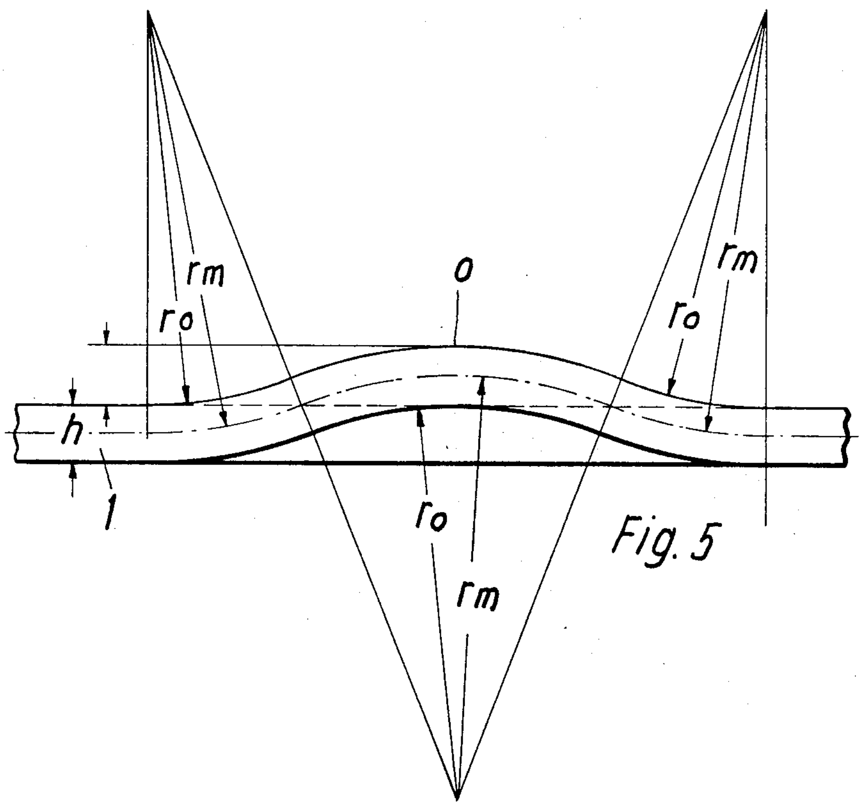
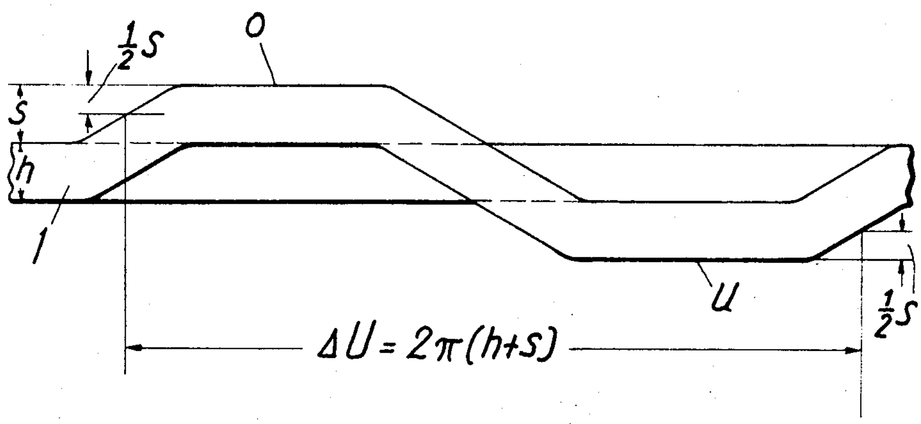


Fig. 5



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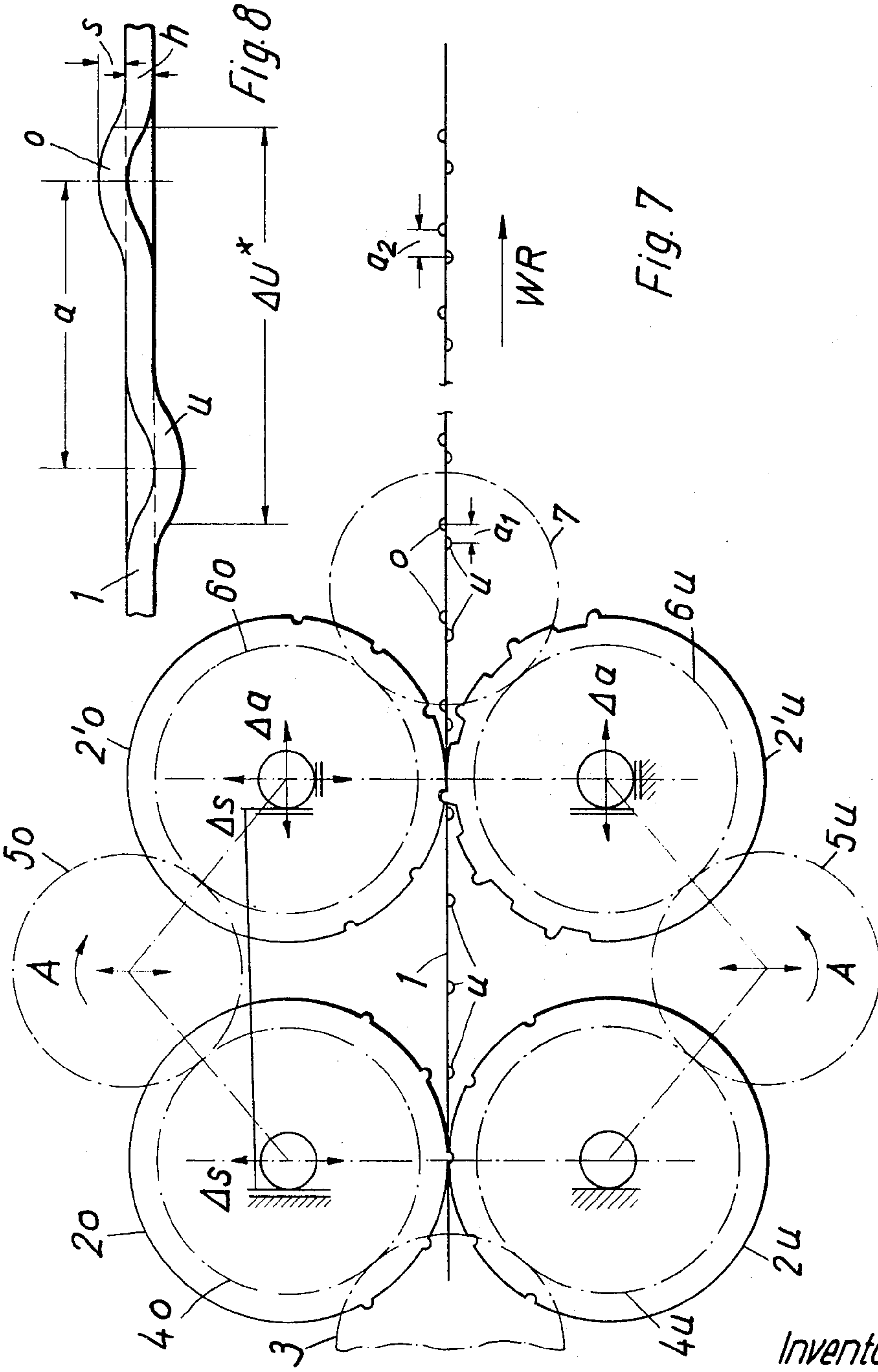

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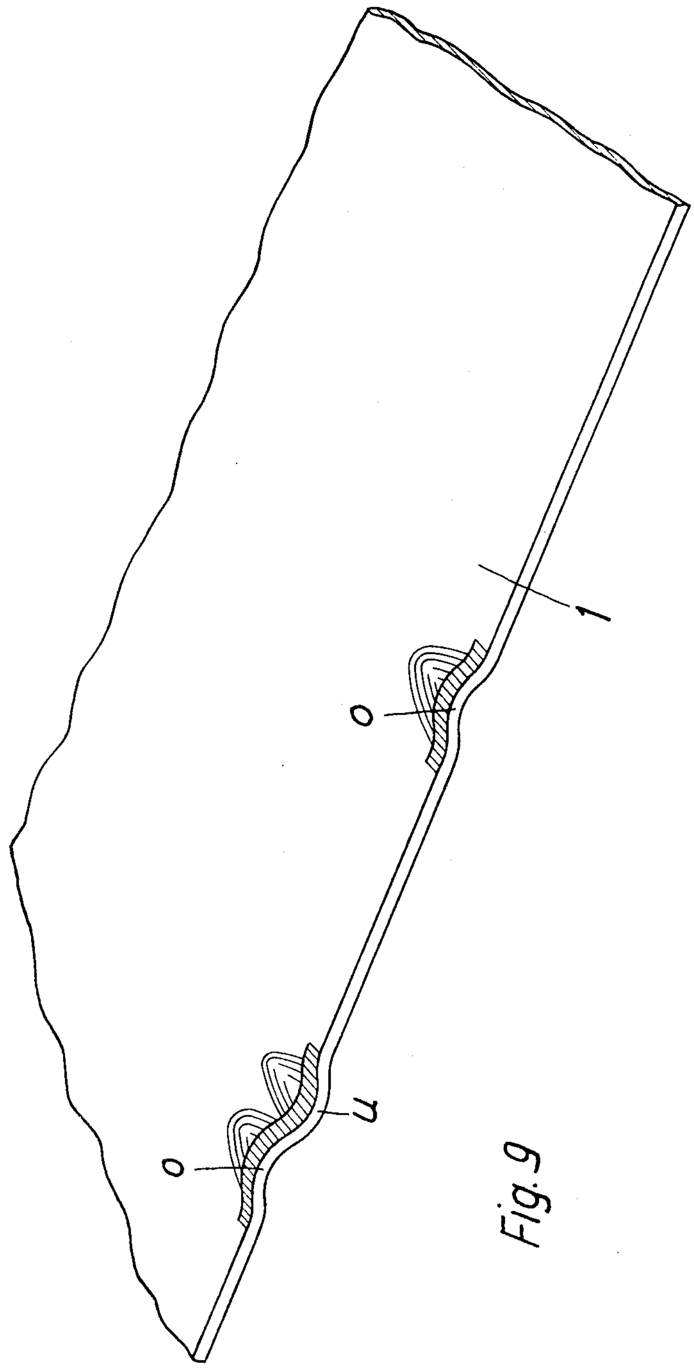

Fig. 9

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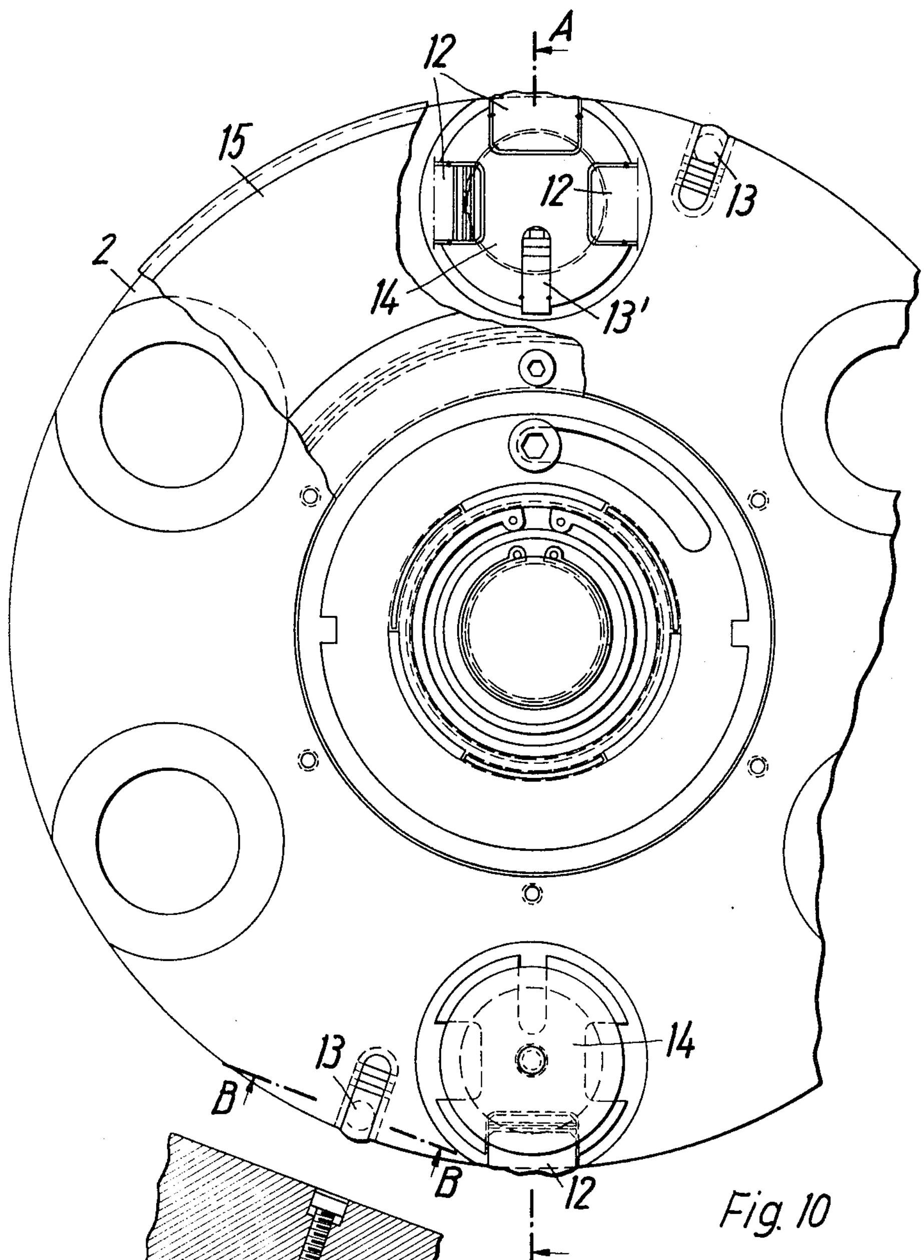

Fig. 10

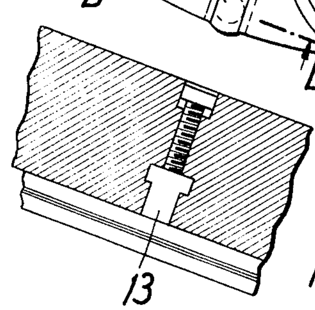

Fig. 11

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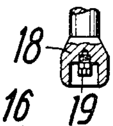

Fig. 15

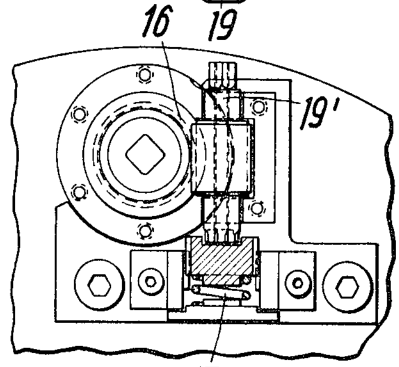

Fig. 14

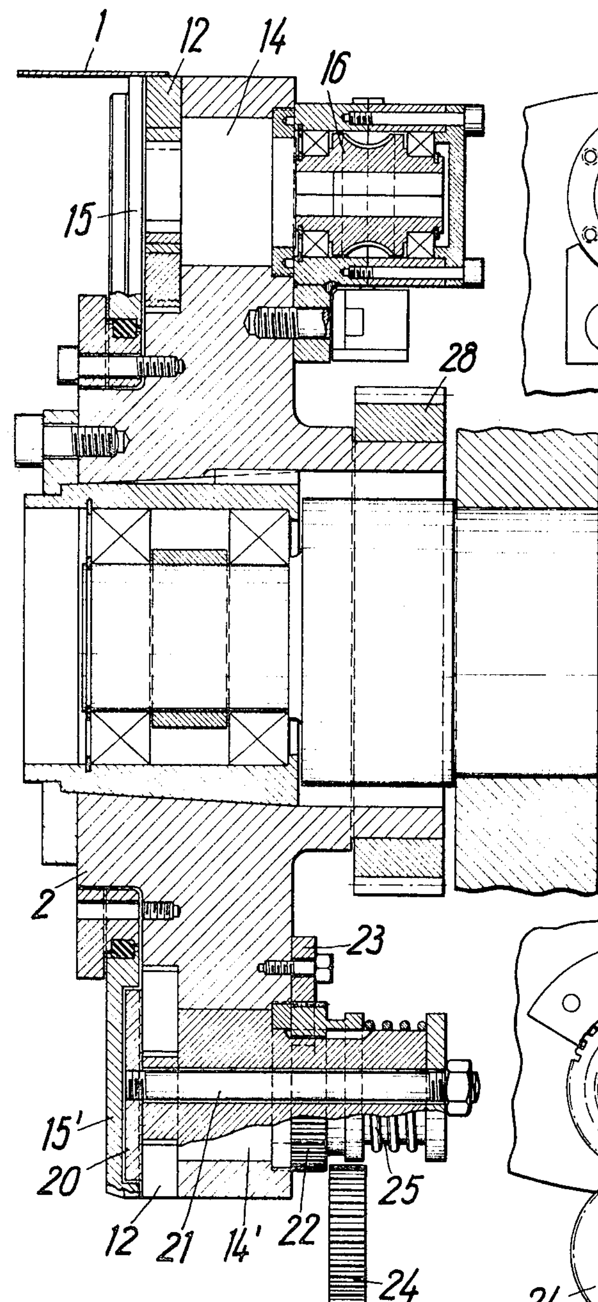

Fig. 12

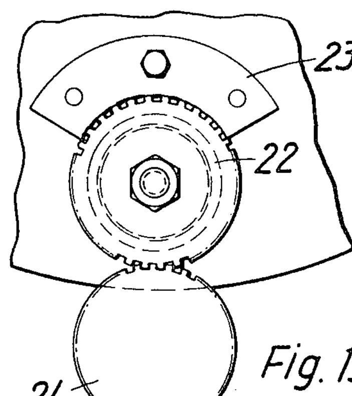

Fig. 13

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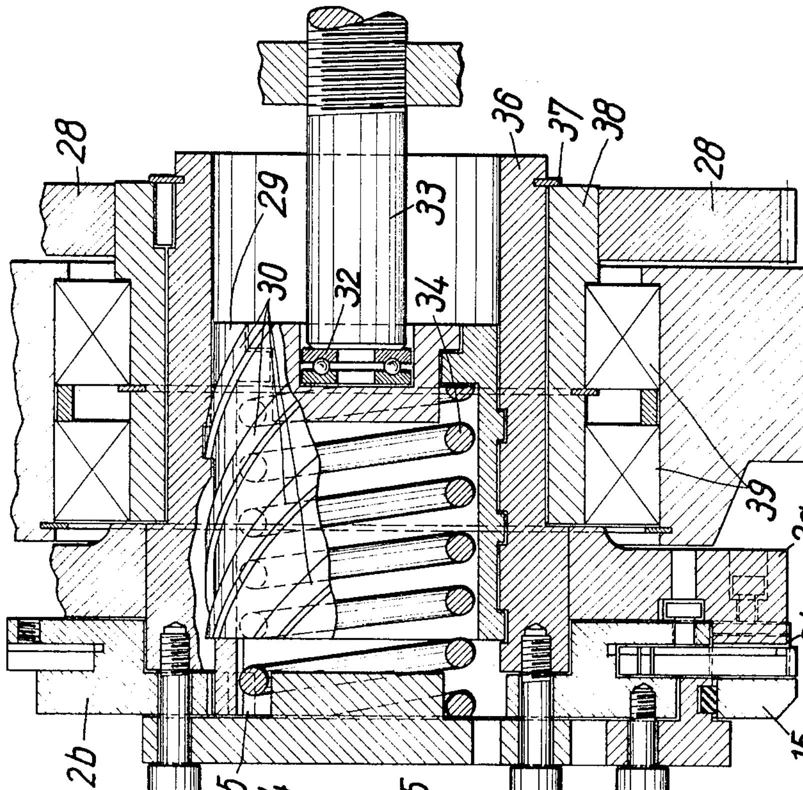

Fig. 17

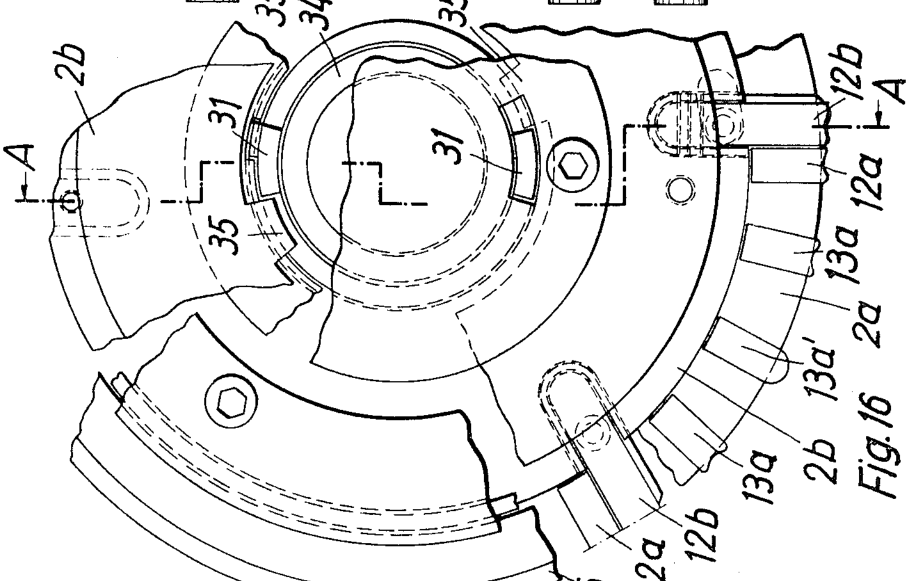

Fig. 16

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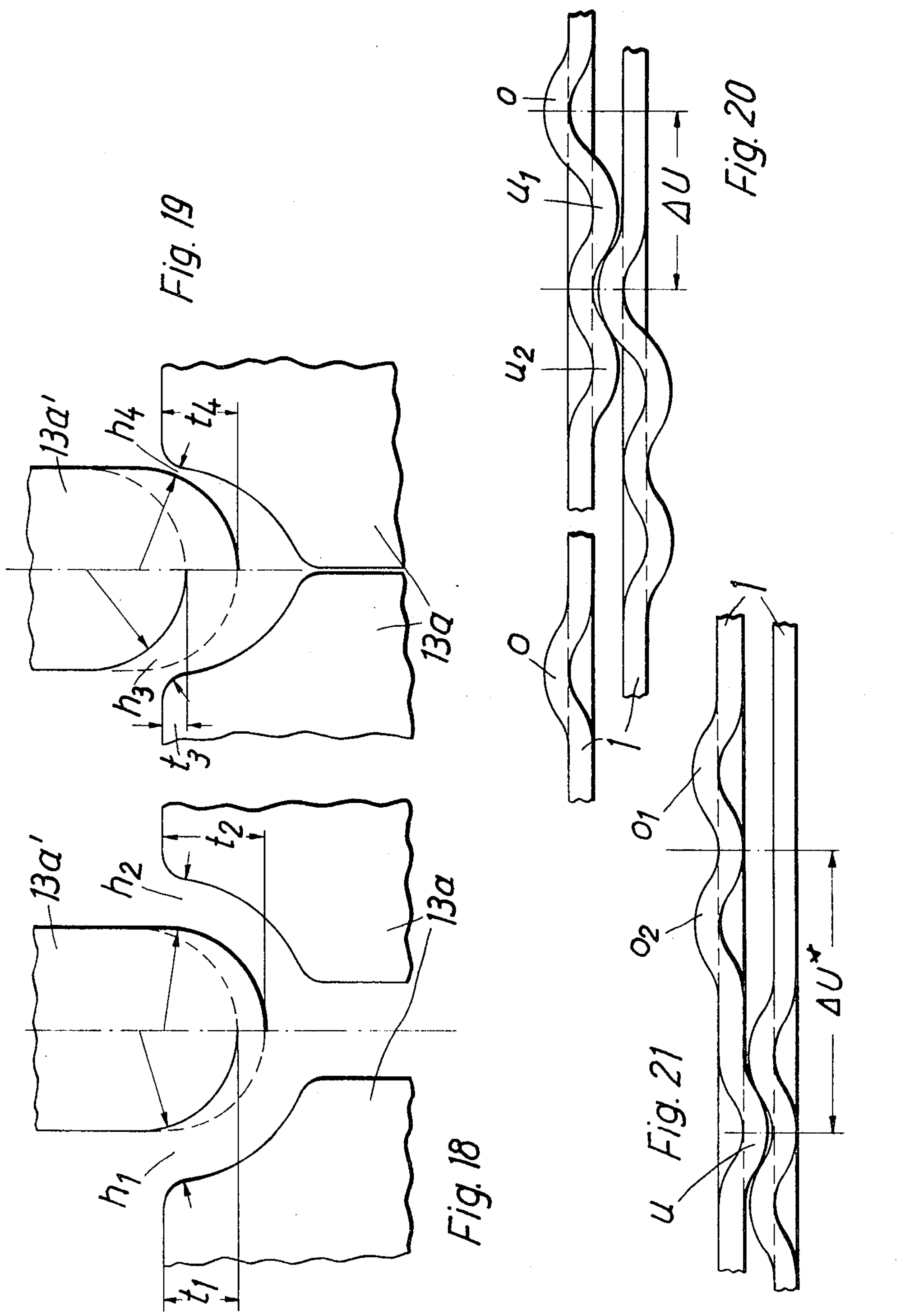

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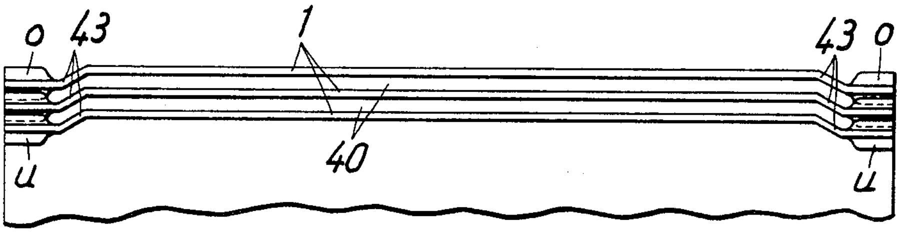

Fig. 23

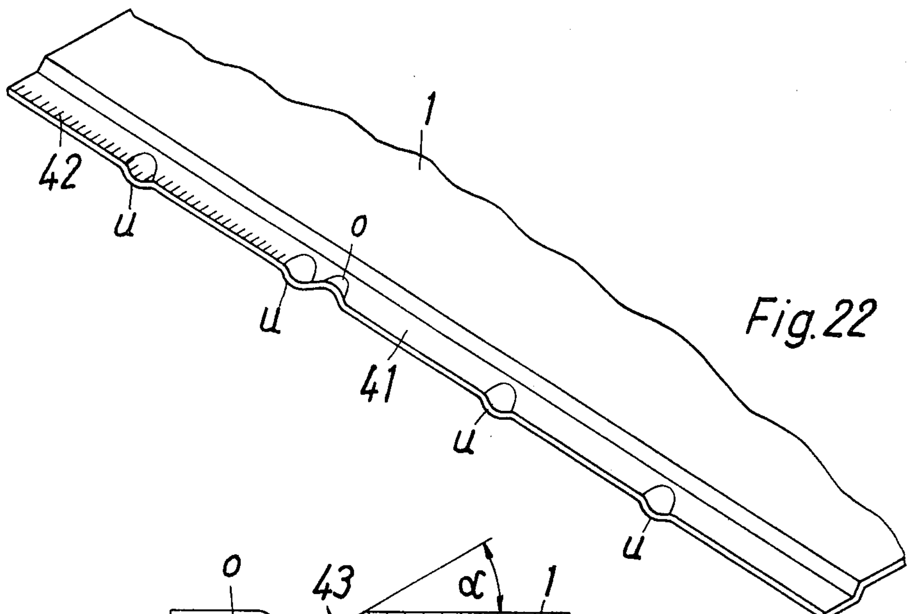

Fig. 22

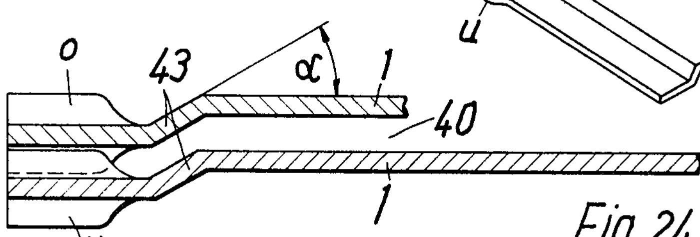

Fig. 24

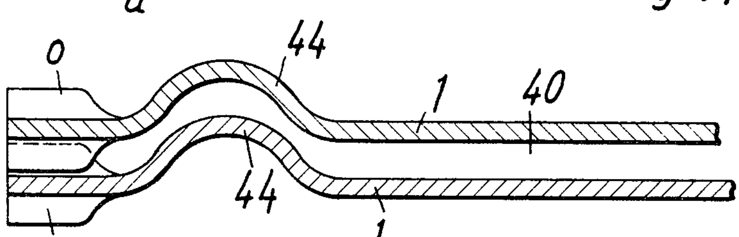

Fig. 25

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METHOD OF AND DEVICE FOR THE COILING OF METAL TAPE OR STRIP

The invention relates to a method and a device for the coiling of metal tape or strip.

It is known that metal tapes are subjected to cold work-hardening during cold rolling, and this can generally be removed by annealing the tape to achieve recrystallization whilst the tape is reeled on a support. In this process it is advantageous for the individual convolutions of the wound tape to be spaced apart by a certain distance from one another so that the hot gases generated in the annealing process can also penetrate into the inside of the reel in order to heat the whole tape in an essentially shorter time.

In order to wind the convolutions of a reel loosely, it is already known to unwind a reel arranged with its axis vertical from a turntable and then re-wind it onto a vertical mandrel which projects from the turntable, whereby the tape convolutions in the re-wound reel are spaced apart by a nylon thread. After the winding process this nylon thread must be removed.

In a similar known technique two twisted steel wires are used instead of the nylon thread and these steel wires remain in the reel during annealing so as to hold the convolutions in the desired spacing.

With these techniques it is however necessary to provide winding apparatus after the annealing process in order to re-tighten the loosely wound reel, since with a loosely wound reel the danger arises that the adjacent convolutions may be moved relative to one another (i.e. in a direction tangential or axial to the axis of the reel) whereby the surface of the tape material will be damaged.

It has all been suggested to enclose elements between the tape convolutions in the region of the edges of the tape in order to ensure separation of the convolutions when winding tape onto a winding mandrel about a horizontal axis. For winding about a horizontal axis it has been further suggested to provide the edges of the tape with depressions along the circumference of every other convolution and extending essentially perpendicularly to the tape surface. According to a further suggestion when winding metallic tapes onto a winding mandrel about a horizontal axis, the tape to be wound is continuously provided at the edges with depressions extending essentially perpendicularly to the surface of the tape and appearing alternately from the two tape surfaces, whereby the distance between adjacent depressions is such that the depressions in adjacent convolutions do not lie opposite to each other, the adjacent depressions being bent alternately in different directions relative to the tape edge.

With these methods for separating the convolutions of a reel of wound tape the stability of the reel in directions tangential to its axis depend on friction which in turn depends on the radial compression resulting from the tape's tensile stress.

Objects of the present invention are to provide an improved method of and an improved device for winding metal tapes wherein the tangential stability of the reel does not depend on friction and radial compression.

According to one aspect of the invention, there is provided a method of coiling metallic tape with spaced convolutions, whereby both rims of the tape are deformed, characterized in that the tape is wound on a horizontal axis and is provided at its edges with deformations arranged so that deformations in adjacent convolutions interlock to prevent relative tangential and/or axial movement between said convolutions.

The deformations may be arranged so that they are shaped as sinusoidal half waves which project from both tape surfaces. Alternatively, the half waves may be arranged to project from one tape surface only in which case they may be formed to different lengths and depths. It can then be arranged that a pair of deformations on adjacent convolutions interlock in such a manner as to prevent relative movement between said convolutions in tangential and axial directions. Such an arrangement is especially advantageous for relatively thin tape material. Prevention of relative tangential movement is however sufficient for a relatively thicker material, since the latter will be essentially stiffer in itself.

One or both faces of the tape may also be milled along one or both edges of the tape (this being in addition to the wave-like deformations referred to above) and such milling will also assist in preventing relative tangential movement of adjacent convolutions.

Furthermore, the tape edges may be bent relative to the central part of the tape either along the whole length thereof or intermittently along the length of the tape. The angle of bending between an edge bent in this way and the central part of the tape and also the width of the bent edge may be varied as desired.

The invention has the advantage that the tangential interlocking of adjacent convolutions of the reel and therewith the stability of a loosely wound reel is independent of friction and radial compression of the reel. During the winding of tape into a reel and if deformations are spaced apart by a distance equivalent to the length of the circumference of the first convolution, the circumferential distance between deformations on adjacent convolutions (because of the increasing diameter of convolutions as winding proceeds) is represented by the formula $\Delta U = 2\pi \cdot \Delta r = 2\pi\ (h+s)$, where Δr is the increase in radius of the coil, h the tape thickness and s the space between convolutions. Interlocking of deformations in adjacent convolutions to prevent relative tangential movement of the convolutions in at least one direction can be achieved by providing two sinusoidal half waves which run into each other and project respectively from the two faces of the tape so as to form a complete wave having an amplitude which is equal to the above-mentioned circumferential displacement ΔU.

Since normally all tapes must also be edged (i.e. have their edges shaved or cut before use), no additional material loss arises from the method according to the invention, since the edge deformations will i.e. in the discarded edge portions.

The procedure of carrying out the method according to the invention is generally that of the cold-rolled tape is immediately after the last deformation or reducing pass provided with the described deformations along the edges and is then reeled to form a coil having spaces between the individual convolutions. The annealing process takes place thereafter. Since the hot gases can quickly penetrate into the inside of the coil, the annealing process can be carried out essentially quicker in relation to known methods. Further, more stacked coils can be annealed simultaneously because of the higher buckling resistance of the coils. After the annealing process has taken place finishing occurs and this is followed by edging the sides of the tape, whereby at the same time the edge deformations will be cut off. Thus no re-winding process takes place with this method. This advantage can especially be emphasized by the fact that where nylon thread or a twisted wire is inserted at least two winding processes are necessary, that is, first of all, a loose winding and afterwards the tight re-winding of the coil.

The present invention also resides in a device for manufacturing tape edge deformations acting in a manner to interlock adjacent convolutions in a coil of tape wound on a horizontal axis, whereby said device comprises a plurality of pairs of disc bodies each having deformation tools, the two disc bodies of each pair of said bodies being continuously adjustable in use relative to each other in a direction perpendicular to the tape, and the pairs of said bodies being continuously adjustable in use relative to each other in a direction parallel to the tape so that the depths of said tape edge deformations and the distance between them can be varied as desired.

With apparatus as above-described there may be provided in each of said disc bodies a tool holder which is rotatable by means of a worm device into a working position and which can be locked there. Locking can, for example, be attained by means of a cog wheel and an accompanying toothed segment.

In this way the shape and spacing of the sinusoidal half wave deformations can be continuously changed if desired during the passage of the tape. Thus, observation of the reel with the aid of a stroboscope can be used in determining the adjustment which may be required.

Where use is made of rotatable individual tools comprising sinusoidal individual punches the necessary adjustment can be obtained by a small enlargement of the deformation depth and therewith the spaces between convolutions. This alteration of the deformation depth can be automatically coupled with the increasing winding radius, so that the constant controlling with the aid of a stroboscope is not necessary.

With another form of tools, both sinusoidal half-waves of the tape edge deformation are produced by punches which are fixed to two co-axial relatively rotatable discoid punch holders. With this construction the spacing of the two half waves can be continuously altered during use by a relative twisting of said discoid punch holders.

Tests for manufacturing an open coil have shown that the tape tension during winding, which decreases from the first to the last convolution proportionally with the winding radius, because of the necessary constant winding momentum, affects the spacing between convolutions. The reason for this lies in the elasticity of the already wound convolutions, since deformations in the convolutions are retarded in accordance with the formula $U_n = 2\pi(h + S_n)$, so that the deformations of the last wound convolutions are deposited on a flexible underlay. In order to decrease this flexibility and thereby a decrease of the desired space between convolutions as much as possible, the winding must be carried out with as little tape tensile stress as possible.

On the other hand little tape tensile stress during the rolling-up also means little stability against telescopic side slipping of the convolutions in an axial direction, which can only be avoided by a special construction of the edge deformation. Therefore, some punches of the tool may be arranged to produce a tape edge deformation pattern on both tape edges with different inclinations to the length of the tape. These punches not only produce an interlocking connection in the coil in a tangential direction, but also in an axial direction.

The invention is further explained with the aid of the attached drawings, which however merely illustrate by way of example ways in which the invention can be carried into effect.

In the drawings:

FIG. 1 is a side view of part of a tape edge deformation tool as well as a partially rolled-up coil, whereby the tape rim deformation is formed as a sinusoidal wave projecting from both tape surfaces, and as a half wave projecting from one tape surface,

FIG. 2 is a side view of part of a tape edge deformation tool as well as a partially rolled-up coil whereby the tape rim deformation is formed as an angular half wave projecting from one tape surface only,

FIG. 3 is an enlarged sectional side view of adjacent tape convolutions in a developed form according to the tape rim deformation of FIG. 2,

FIG. 4 is an enlarged side view of part of a tape showing tape edge deformations as sinusoidal waves projecting from both tape surfaces according to FIG. 1,

FIG. 5 is an enlarged side view of part of a tape, whereby the tape edge is deformed as a half wave projecting from one tape surface according to FIG. 1,

FIG. 6 is an enlarged side view of part of a tape, whereby the tape edge is deformed as an angular wave projecting from both tape surfaces,

FIG. 7 is a side view of a tandem tool for producing a tape edge deformation,

FIG. 8 is an enlarged side view of part of a tape, whereby half waves projecting respectively from both tape surfaces are spaced apart and integrally connected by a portion of the tape which is undeformed,

FIG. 9 is a perspective illustration of part of a tape comprising a single half wave and a double half wave in sinusoidal form according to FIG. 1,

FIG. 10 is an enlarged partial side view of a tape edge deformation tool,

FIG. 11 is a part sectional view taken along the line B—B of FIG. 10,

FIG. 12 is a sectional view taken along the line A—A of FIG. 10,

FIG. 13 is a plan view of part of FIG. 12 showing cog wheel 22 and toothed segment 23,

FIG. 14 is a plan view of part of FIG. 12 showing, inter alia, worm drive 16,

FIG. 15 is a sectional illustration of an adjusting key 18,

FIG. 16 is a partial side view of an alternative form of deformation tool having individual punches,

FIG. 17 is a sectional view taken along the line A—A of FIG. 16,

FIG. 18 is a side view of a pair of tools, consisting of a single upper punch and a two-part bottom die which is opened to the fullest extent, the upper punch being movable between a position which accommodates tape having thickness h, and deformation depth t, and a position which accommodates tape having thickness h_2 and deformation depth t_2.

FIG. 19 is a side view of a pair of tools consisting of a single upper punch and a tow-part bottom die which is in a closed position, the upper punch being movable between a position which accommodates tape having thickness h_3 and deformation depth t_3, and a position which accommodates tape having thickness h_4 and deformation depth t_4,

FIG. 20 is a developed side view showing tape edge deformation providing stability in both tangential directions and having a constant circumferential distance between deformations on adjacent convolutions,

FIG. 21 is a developed side view showing tape edge deformation providing stability in both tangential directions and having a variable circumferential distance between deformations on adjacent convolutions.

FIG. 22 is a perspective view showing a tape having a bent edge area which is provided with local deformations,

FIG. 23 is a partial cross-section of a coil formed as shown in FIG. 22,

FIG. 24 is an enlarged partial cross-section of tape seen in FIG. 23, and

FIG. 25 is a partial cross-section of tape showing a modification of the arrangement seen in FIGS. 23 and 24.

Referring firstly to FIG. 1, the tape 1 is deformed along its edges before being wound onto the spool 8, which turns in the direction of the arrow, by tape edge deformation tools 2*o* and 2*u*. The deformation tools consist, on each side of the tape, of a disc 2*o* arranged above the tape and a disc 2*u* arranged below the tape. The peripheral configuration of the discs is constructed such as to form alternately the deformations *o* projecting from one tape surface as well as the deformations *o* and *u* which form a complete sine wave. (FIG. 1 shows only those parts of the tools 2*o* and 2*u* adapted to produce the deformations *o*). The half waves *o* serve for maintaining the spacing of the individual convolutions 1′ of the wound coil 9, and the double half wave *o* and *u* for maintaining spacings as well as for the formation of the interlocking connections between the convolutions.

The arrangement shown in FIG. 2 differs from the illustration of FIG. 1 inasmuch as the edge deformations in tape 1 are only constructed as angular half waves 10 and 11′ (produced by those parts of the tools 2*o* and 2*u* shown), as well as 11, projecting from one tape surface. The tape thickness is indicated by h, the height of the edge deformation over the tape surface by s and the circumferential distance between the deformations in adjacent convolutions of the tape deformation is indicated by ΔU, as can be seen from the enlarged developed view seen in FIG. 3 where $\Delta U = 2\pi\ (h+s)$. FIG. 3 also clearly shows that this kind of edge deformation provides an interlocking connection in both tangential directions. This is especially advantageous for relatively thin tape material, and the geometrical shape of the edge deformation is naturally not tied to angular deformations according to the illustrations in FIGS. 2 and 3, but can also be of another (e.g. rounded shape) since the main thing is that the interlocking connections act in both tangential directions. On the other hand, for relatively thick tape material an interlocking connection acting in only one tangential direction is sufficient, since the thicker tape material is essentially stiffer in itself.

In FIG. 4 the two sine-half waves *o* and *u*, projecting respectively from opposite surfaces of the tape, merge to form a complete sine wave.

FIG. 7 shows a tandem tool which consists of the tool parts 2*o*, 2*u* as well as 2′*o* and 2′*u*. Tool parts 2*o* and 2*u* produce the deformation *u* on the edge of the tape 1, and tool parts 2′*o* and 2′*u* produce the deformations *o* on the edges of the tape 1.

The deformations o and u can be adjustably spaced, say by a_1 or a_2 and the direction of winding is indicated by W_R. The cog wheels 3 (which may be driven), 4*o* and 4*u*; 5*o* and 5*u*; 6*o* and 6*u* as well as 7 connect all the tool parts to ensure the synchronous running of the whole tool despite the possibilities of moving said tool parts. Thus, as indicated by the arrows in FIG. 7, tools 2*o* and 2*u* and also tools 2′*o* and 2′*u* can be moved relatively in a direction perpendicular to the length of the tape in order to vary the depth of the deformations as required whereas tools 2′*o* and 2′*u* can be together moved towards and away from tools 2*o* and 2*u* to vary the spacings a_1 and a_2.

FIG. 8 shows an enlarged side view of a tape edge deformation consisting of the tape deformed by the device according to FIG. 7, whereby the half waves *o* and *u* are spaced by a distance a, h gives the tape thickness and s the depth of deformation which is equal to the convolution spacing in the wound tape. Such kind of tape deformation, comprising an undeformed portion of tape integrally interconnecting half-waves which project in opposite directions, is especially suitable for balancing the coil during the winding of the tape to ensure that the desired interlocking of the deformation occurs. The main thing here is to adjust the dimension ΔU^* as shown in FIG. 8 and this can be done by the operator as winding proceeds by adjusting the relative positions of tools 2*o* and 2*u* and 2′*o* and 2′*u* as above-described. Thus, the downwardly directed deformation U in one convolution and the upwardly directed deformation O of the adjacent convolution should lie closely adjacent to each other in such a way that they can transmit tangentially directed thrust faces in a form locking manner from convolution to convolution. In order to attain this, the contact between the first two convolutions is stroboscopically observed and the tools 2*o*, 2*u*, 2′*o* and 2′*u* are adjusted by the operator until the desired conditions are fulfilled. Once these conditions have been fulfilled they should be maintained but it may be advantageous to check occasionally during winding of the coil that the deformations in adjacent convolutions are maintained in the correct relative relationship.

In FIGS. 10–14 there is shown a tape edge deformation tool which comprises disc 2, punch holders 14 having punches 12 and 13′ as well as a number of single punches 13 and a clamping disc 15. FIG. 11 shows the single punch 13 in a transverse section.

As shown in FIG. 12 the tape 1 is clamped in the region of its edges by the clamp portion 15 (it being understood, of course, that the tape will pass between a pair of tools each formed as shown in FIGS. 10–14 and arranged on opposite sides of the tape) and is deformed by the punches 12 which are tightly mounted in the rotatably adjustable punch holders 14. The punch holder 14 seen in the upper part of FIG. 12 is rotated and locked by a worm drive 16. The bottom part of FIG. 12 shows an alternative construction in which a punch 12 is secured by means of a clamping plate 20 which is arranged in a recess of a clamp 15′ rotating with the supporting disc 2, and by the tightening screw 21. The punch holder 14′ is fixed in working position by means of the cog wheel 22, inner toothed segment 23 and tension spring 25.

The fixing of the punch holder 14′ to the cog wheel 22 and the inner toothed segment 23 as shown in FIG. 13 operates as follows:

After having pulled the cog wheel 22 out of engagement with the toothed segment 23 against the pressure of the spring 25 in FIG. 12 and interlocked it with the cog wheel 24, one can undertake the shifting of the punch holder 14 by a corresponding angular movement of the cog wheel 24.

The fixing of the punch holder 14 in FIG. 12 with the aid of the worm drive 16 operates in the following way:

After having released the worm with the aid of the pin 19′, extending through the center boring of the worm, against the pressure of a spring 17, the movement of the punch holder 14 can be undertaken with the aid of a pin 19, arranged in the adjusting key 18 of FIG. 15, by a corresponding movement of the worm via the worm drive 16. As shown in FIG. 15, the adjusting key 18 is provided with an unlocking pin 19.

In FIGS. 16 and 17, there is shown a two-disc tool (this being one of a pair of tools which would be disposed on opposite sides of the tape edge) for producing the edge formation, said tool comprising a fastening disc 2 a for the punches 12*a*, 13*a*, 13*a*′ and a co-axial fastening disc 2*b* for the punches 12*b*. The fastening discs 2*a* and 2*b* can be turned through a small angle relative to each other and can then be fixed in a new relative position. This relative turning is achieved by a movement of a pin 33 acting through a thrust bearing 32 on a casing 29 having screw thread 30, so that axial movement of said pin 33 will also result in axial movement of the casing against the pressure of a spring 34. The screw thread 30 engages an internally threaded sleeve 36 which is secured to disc 2*a*. Dogs 31 and 35 are provided in casing 29 and disc 2*b* respectively. Thus axial movement of said casing 29 through the pin 33 will result in relative rotation between the casing and the sleeve 36 and, through the dogs 31 and 35, relative rotation between the discs 2*a* and 2*b*. Whilst adjustment is being carried out, disc 2*a* will in fact remain stationary whilst disc 2*b* will turn. Sleeve 36 is itself fixed in the bearing 39 inside the intermediate sleeve 38 and is axially located at one end by circlip 37 which can be removed when it is desired to dismantle the tool. Furthermore, disc 2*b* carries punches 12*b* whereas disc 2*a* carries punches 12*a*, 13*a* and 13*a*′. The drive of the tool as well as synchronization with the co-acting tool (not shown) on the other side of the tape edge is effected via the cog wheel 28.

With the construction shown in FIGs. 10–12, the punch holder 14 or punch holder 14′ would be rotated when the tool is at rest so that different combinations of punches can be used. In each of the punch holders 14 and 14′ are provided three punches 12 and one punch 13′. There are also provided in the tool other punches 13. If tool holder 14 is set to expose one of the punches 12 whereas the other tool holder 14′ is set to expose punch 13′, the other co-acting tool being set likewise, then the spacing between sinusoidal deformations on the tape edge will be equivalent to the circumference of the tool disc 2, said sinusoidal deformations being interspaced by half wave deformations formed by punches 13 or 13′. On the other hand if each holder 14 and 14′ is set to expose a punch 12 then the spacing between adjacent sinusoidal deformations will be equal to half the circumference of tool disc 2, intermediate half wave deformations being produced by punches 13 as before.

FIGS. 18 and 19 show a punch 13*a*′ and a die 13*a* as seen in FIG. 16 but on a larger scale, 13*a*′ representing a punch adjustable to the depth of t_1 and t_2 (in FIG. 18) and t_3 to t_4 (in FIG. 19) and 13*a* a divided or split bottom die whose width of expansion can be adjusted to the tape thickness h_1 to h_2 (in FIG. 18) or h_3 to h_4 (in FIG. 19).

FIGS. 20 and 21 show a tape convolution 1 in a developed condition and having edge deformations of the bottom half-waves u, u_1, u_2 and the upper half waves o, o_1, o_2, the tightly adjusted value ΔU and the variable value ΔU^*.

Tape 1 illustrated in FIG. 22 and deformed along its edges according to the invention is also deformed by bending of the whole tape edge area 41 relative to the central part of the tape. This tape edge area 41 receives afterwards the deformations o and u, which comprise half waves u projecting from one tape surface and sine waves o and u projecting from both tape surfaces. The longitudinal tape edges are additionally provided with a fine milling 42.

From the sectional drawings shown in FIGS. 23 to 25 it can be seen that the deformations o and u in the tape edge arrange themselves in an interlocking manner against one another in the wound coil. The bending resistance of the tape edge can be altered within wide limits by varying the bending angle α and/or by bending a different width of the tape edge. Instead of the bending according to FIG. 24, the rounded bending deformation 44 seen in FIG. 25 also offers a useful resistance to undesirable buckling of the tape edge area.

What we claim is:

1. In a method of coiling metal tape with spaced convolutions whereby both rims of the tape are deformed, the steps of: winding the tape on a horizontal axis and deforming the edges with deformations arranged so that the deformations in adjacent convolutions interlock for preventing relative tangential and axial movement between the convolutions.

2. In the method according to claim 1, characterized by the step: forming the deformations as half waves projecting from both surfaces of the tape.

3. In the method according to claim 2, characterized by the step: forming the half waves in sinusoidal configuration.

4. In the method according to claim 1, characterized by the step: forming the deformations as half waves having different lengths and depths and projecting from one of the surfaces of the tape.

5. In the method according to claim 4, characterized by the step: superimposing the half wave-like deformations on a milled edge of the tape.

6. In the method according to claim 5, characterized by the step: milling the edge of the tape at the convolutions adjacent the reel.

7. In the method according to claim 6, characterized by the step: bending the tape edge out of the main plane of the tape.

8. In the method according to claim 7, characterized by the step: bending the tape edge out of the main tape plane in a continuous manner.

9. In the method according to claim 8 characterized by the step: varying the buckling resistance of the tape edge by altering the bending angle between the bent edge and the main tape plane and by varying the width of the bent edge of the tape.

10. In the method according to claim 9 characterized by the step: making the cross sectional shape of the tape adjacent its edges similar to a stretched Z.

11. In the method according to claim 6, characterized by the step: bending the tape edge out of the main tape plane in an interrupted manner.

12. A device for manufacturing tape edge deformations acting in a manner to interlock adjacent convolutions in a coil of tape wound on a horizontal axis whereby tool equipped tool holders rotatable into a working position are provided on the periphery of a pair of disc-bodies arranged respectively on opposite sides of the tape edge.

13. A device according to claim 12, characterized in that the tool holders are rotatable into working position via a worm drive.

14. A device according to claim 13, characterized in that the tool holders are lockable via a cog wheel and a toothed segment.

15. A device for manufacturing tape edge deformations acting in a manner to interlock adjacent convolutions in a coil of tape wound on a horizontal axis, whereby said device comprises a plurality of pairs of disc bodies each having deformation tools, the two disc bodies of each pair of said bodies being continuously adjustable in use relative to each other in a direction perpendicular to the tape, and the pairs of said bodies being continuously adjustable in use relative to each other in a direction parallel to the tape so that the depths of said tape edge deformations and the distance between them can be varied as desired.

16. A device according to claim 15, characterized in that two pairs of disc-bodies equipped with deformation tools are arranged respectively on opposite sides of the tape edge.

17. A device according to claim 16, characterized in that at least two deformation tools acting upon the same tape surface are arranged on a common axis.

18. A device according to claim 15 characterized in that there are four deformation tools acting upon the same tape surface which are arranged on two parallel axes spaced apart along the length of the tape.

19. A device according to claim 18, characterized in that the tools are driven by means ensuring synchronous running.

20. A device according to claim 19, characterized in that said means ensuring synchronous running consists of cog wheels.

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