(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 015 145 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
18.12.2002 Bulletin 2002/51

(21) Application number: **96906144.9**

(22) Date of filing: **06.03.1996**

(51) Int Cl.[7]: **B21C 37/12**

(86) International application number:
PCT/SE96/00292

(87) International publication number:
WO 96/027455 (12.09.1996 Gazette 1996/41)

(54) **METHOD AND APPARATUS FOR PRODUCING HELICALLY WOUND LOCK-SEAM TUBING**

VERFAHREN UND VORRICHTUNG ZUM HERSTELLEN VON GEFALZTEN SCHRAUBENNAHTROHREN

PROCEDE ET APPAREIL DE PRODUCTION D'UN TUBE A SERTISSAGE ENROULE DE MANIERE HELICOIDALE

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI NL PT SE

(30) Priority: **08.03.1995 US 400752**
12.05.1995 SE 9501750

(43) Date of publication of application:
05.07.2000 Bulletin 2000/27

(60) Divisional application:
02014515.7

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EP 1 015 145 B1

Printed by Jouve, 75001 PARIS (FR)

Description

FIELD OF THE INVENTION

[0001] The present invention relates to the production of helically wound tubing, and more specifically to a method and an apparatus for producing helically wound lock-seam tubing from a strip of sheet metal, see for instance US-A-3, 604, 464. The tubing can, for example, be used in ventilation duct systems.

BACKGROUND ART

[0002] A known machine for producing helically wound lock-seam tubing is disclosed in British patent publication GB 2,213,748, which is incorporated herein by reference. In this machine, a metal strip is fed to a forming head by means of drive rollers, and a helically wound lock-seam tube is formed by clinching rollers associated with the forming head.

[0003] Another known machine for producing helically wound tubing is disclosed in British patent specification GB 1,168,178, wherein Figs 3 and 4 show different seams.

[0004] The technology related to such machines is well-known to persons skilled in the art. At present, several further developed machines of a similar type are available on the market. However, these machines still suffer from some specific drawbacks.

[0005] In the production of helically wound lock-seam tubes of the present type, the lock-seam tends to slip, which results in an undesirable change in tube diameter. The general solution to this problem is to increase the pressure of the clinching rollers acting on the lock-seam in the forming head. However, such an increased clinching pressure can cause damage to and deficiencies in the lock-seam as well as in the adjacent portions of the metal strip forming the tube. Thus, the adjustment of the clinching pressure is crucial to the quality of the lock-seam and the resulting tube.

[0006] In addition to the clinching pressure, the operator running the machine must consider several other parameters, such as the thickness of the metal strip, the lubrication of the same, and possible wear of different machine components, for example the rollers. Thus, great demands are made on the skill and experience of the operator.

[0007] In spite of the operator's skill, it is hard to avoid slip or sliding in the lock-seam. An undesirable increase of the tube diameter can occur either in production, immediately after the forming head, or during storing, handling and transportation of the tubes. It should be noted that the tube diameter may also be undesirably reduced due to lock-seam slip, for example when tubes are subject to pressure forces from the outside.

[0008] The change in tube diameter is always a problem, since the tubes delivered do not fulfil the customers' specifications and requirements.

[0009] Specific problems are encountered when using the tubes in ventilation duct systems mounted on different premises. For example, vibrations caused by fans and similar equipment can initiate lock-seam slip which, in turn, leads to undesirable leakage of air and pressure drops. In severe cases, lock-seam slip of the ventilation ducts can jeopardize safe function of the whole ventilation system.

[0010] In ventilation duct systems, different fittings are connected to the helically wound lock-seam tubes forming the major part of the system. Such fittings are bends, T-pieces, dampers, sound attenuators, etc. The fittings are normally inserted in the end of the tubes, and a sealing ring on the inserted portion of the fitting ensures safe sealing. However, if the tube has an undesirably increased diameter, there is a risk that sufficient sealing cannot be obtained in the joint between the fitting and the tube. This may lead to the leakage and pressure drop problems discussed above, resulting in energy losses and increased running costs.

[0011] In other cases, the fitting is not provided with a pre-mounted seal, but the joint between the outside of the fitting and the inside of the tube is filled with a mastic for sealing purposes. If the gap is too large due to an undesirably increased tube diameter, sufficient sealing may not be obtained by means of the mastic. Even if the mastic is safely fastened, problems may arise later due to increased tube diameter caused by vibrations, air pressure peaks, etc.

[0012] Further, change in tube diameter is disadvantageous when prefabricated annular fastening devices and the like are to be applied on the outside of the tube. Such devices do not fit if the tube diameter has changed.

SUMMARY OF THE INVENTION

[0013] One object of the present invention is to remedy the above-mentioned drawbacks by providing a method and an apparatus for producing helically wound lock-seam tubing with no or very low risk of lock-seam slip or sliding in any direction.

[0014] Another object of the present invention is to provide a method and an apparatus for producing helically wound lock-seam tubes which maintain their diameter during storing, handling, transportation, delivery and mounting on the final site.

[0015] A specific object of the invention is to provide a method and an apparatus which are easily adapted to existing machines.

[0016] In accordance with the invention, these objects are achieved by a method, an apparatus and a tube as set forth in the appended independent claims 1, 5 and 13, preferred embodiments and variants thereof being defined in the related subclaims.

[0017] The invention makes it possible to avoid lock-seam slip and achieve further advantages.

[0018] An important advantage is that the spaced deformations on the lock-seam immediately indicate that

the tube in question has a securely interlocked lock-seam which in turn results in a constant diameter of the tube. Another advantage is that the means for providing such interlocking deformations can either be incorporated in new machines or easily mounted on existing machines as additional equipment.

[0019] Since the interlocking deformations on the lock seam of the tube are formed as expanded portions, the wear of the means providing the interlocking deformations can be kept very low. Most preferably, a clinching roller of the clinching assembly has a peripheral groove which is provided with at least one recess for forming the expanded portions of the lock seam.

[0020] Preferably, at least one interlocking deformation is provided on each helical turn of the lock seam in order to reduce the risk of slipping in the same.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The invention will now be described with reference to the accompanying schematic drawings showing preferred embodiments by way of example.

Fig. 1 illustrates schematically a machine for producing helically wound lock-seam tubing.

Fig. 2 illustrates schematically a clinching assembly incorporated in a machine according to an embodiment of the present invention.

Fig. 3 shows a helically wound lock-seam tube produced by a method and an apparatus according to one embodiment of the present invention.

Fig. 4 shows, on a larger scale, a lock-seam of the tube shown in Fig. 3.

Fig. 5 shows, on a larger scale, a cross-section of the lock-seam shown in Fig. 3.

Fig. 6 is a partial view of an embodiment of a clinching roller.

Fig. 7 shows a recess of the clinching roller of Fig. 6.

Fig. 8 shows a portion of the clinching roller of Fig. 6 from the side.

Fig. 9 is a sectional view of the clinching roller of Fig. 6 illustrating a lock-seam indicated by dash-dot lines.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0022] The method and the apparatus according to the invention can in principle be applied to a machine of the type as generally shown in Fig. 1. This machine bascially corresponds to the machine described in the publication GB-A-2,213,748 mentioned by way of introduction, some components 47, 48 related to one embodiment of the invention, to be described later, being added in Fig. 1. A metal strip 12 is fed to a forming head 14 by drive rollers 11 (arrow A). The longitudinal edge portions 16 of the strip 12 can be preformed in a known manner by rollers 13. In the forming head 14, the strip 12 is formed into a helical shape, whereby the edge portions 16 are brought into engagement with each other. A clinching assembly 22, 23, 24 is associated with the forming head 14 and includes clinching rollers 17, 18, 19 for clinching the engaging edge portions 16 of the strip 12 to form a helically wound lock-seam 25 on a tube generally denoted 15. In production, the tube 15 is positively fed out of the forming head 14 in a direction shown with an arrow B by the infeeding force of the strip 12. The tube 15 is cut to desired lengths by a cutting device (not shown).

[0023] The machine shown in Fig. 1 can be improved by means of a clinching device of the type illustrated in Fig. 2. This clinching device can be mounted either in or in connection with the forming head 14. The clinching device according to a first embodiment comprises a clinching roller 30 having a shaft 31 which is rotatably supported by bearings 32 (schematically shown) mounted on the forming head 14 (cf. Fig. 1). A counter-roller 34 having a shaft 35 which is rotatably supported by bearings 36 (schematically shown) mounted on the forming head 14 (cf. Fig. 1) is located inside a tube 33. A lock-seam 37 of the tube 33 is clinched between the peripheries of the two rollers 30, 34 at a clinching point. The clinching pressure is adjustable by a device 38 (schematically shown) acting on the shaft 31 in the directions of the arrows.

[0024] The clinching roller 30 has a peripheral groove 39 with at least one transverse recess 40 (see Figs 6-9). At the clinching point between the two rollers 30, 34, this recess 40 forms interlocking deformations 41 on the lock-seam 37. The interlocking deformations 41 are spaced on the helical lock-seam 37.

[0025] The device shown in Fig. 2 works as follows. A metal strip 12 with longitudinal edge portions 16, which may be preformed by rollers 13 (cf. Fig. 1), is formed in the forming head 14. In order to avoid slip in the lock-seam, the engaging edge portions 16 are deformed and interlocked by the deformations 41 formed by the recess 40 of the clinching roller 30. In the first embodiment shown in Fig. 2, the spaced deformations 41 are in the shape of expanded portions of the lock-seam 37. In this way, the engaging edge portions 16 are fixed together in the lock-seam 37, which in turn results in a tube 33 with a constant diameter. Slip in the lock-seam 37 is prevented.

[0026] An important advantage relating to the feature that the interlooking deformations on the lock seam 37 are provided in the shape of expanded portions thereof is that the wear of the clinching means for forming the deformations can be kept at a very low level in relation to known equipment for the production of helically wound lock seam tubing.

[0027] A swollen or expanded deformation 41 is shown in more detail in Fig. 4, and the lock-seam 37 is shown in Fig. 5.

[0028] The recess 40 of the clinching roller 30 of the first embodiment is shown in detail in Figs 6-9. The recess 40 is broader than the groove 39 with respect to

the thickness of the clinching roller 30. The section of Fig. 9 shows the deformation 41 of the lock-seam in the recess 40.

ALTERNATIVE EMBODIMENTS

[0029] According to the clinching roller embodiments described, the clinching roller is arranged outside the tube, whereas the counter-roller is arranged inside the tube. It will be appreciated, however, that the aimed-at deformations can also be achieved if the clinching roller is arranged inside the tube and the counter-roller is arranged outside the tube. The means (for example a recess or a ridge) for providing the interlocking deformations on the lock-seam can be provided on the periphery either of the clinching roller or of the counter-roller. Further, there can be more than one such recess or ridge on the clinching roller or the counter-roller. The important thing is that the aimed-at interlocking effect on the lock-seam is achieved.

[0030] It will also be appreciated that the two clinching roller embodiments can be combined in such a way that a clinching roller is provided with both recesses and ridges of the type shown.

Claims

1. A method for producing helically-wound lock-seam tubing from a metal strip (12) having longitudinal edge portions (16), comprising the steps of: feeding the strip (12) to a forming head (14); forming the strip (12) into a helical form in the forming head (14), whereby the edge portions (16) of the helically formed strip (12) are brought into engagement with each other; clinching the engaging edge portions (16) of the strip (12) to form a helically-wound lock-seam (37) on a tube (33) formed in the forming head (14); and feeding the helically-wound lock-seam tube (33) out of the forming head (14); wherein spaced deformations (41) are provided on the lock seam (37) in order to interlock the engaging edge portions (16) of the strip (12) in the lock-seam (37), **characterised in that** the interlocking deformations are formed as expanded interspaced portions (41) along the lock seam (37).

2. A method as claimed in claim 1, wherein the interlocking expanded portions (41) are provided in an operation performed in connected with the forming head (14).

3. A method as claimed in claim 1 or 2, wherein at least one interlocking expanded portion (41) is provided on each helical turn of the lock seam (37).

4. A method as claimed in any one of the preceding claims, wherein the interlocking expanded portions (41) are formed across the lock seam (37).

5. An apparatus for producing helically-wound lock-seam tubing from a metal strip (12) having longitudinal edge portions (16), comprising means (11) for feeding the strip (12) to a forming head (14); means for forming the strip (12) into helical form in the forming head (14) and for bringing the edge portions (16) of the helically formed strip (12) into engagement with each other; a clinching assembly (30, 34) for clinching the engaging edge portions (16) of the strip (12) to form a helically-wound lock-seam (37) on a tube (33) formed in the forming head (14) ; means for feeding the helically-wound lock-seam tube (33) out of the forming head (14); and means (30, 34, 40) for providing spaced deformations (41) on the lock seam (37) in order to interlock the engaging edge portions (16) of the strip (12) in the lock seam (37), **characterised in that** said lock-seam deformation means (30, 34, 40) is configured to form the interlocking deformations as expanded interspaced portions (41) along the lock seam (37).

6. An apparatus as claimed in claim 5, wherein the deformation means (30, 34, 40) comprises a rotatable clinching roller (30) having a periphery and a rotatable counter roller (34) having a periphery, the lock seam (37) being clinched between the peripheries of the rollers (30, 34) at a clinching point, and either of the rollers (30) having means (40) on its periphery for providing the interlocking expanded portions (41) on the lock seam (37) at said clinching point.

7. An apparatus as claimed in claim 6, wherein the clinching roller (30) is provided with a peripheral groove (39) which comprises at least one recess (40) for providing the interlocking expanded portions (41) of the lock seam (37).

8. An apparatus as claimed in claim 7, wherein the recess (40) is disposed transversely of the peripheral groove (39) of the clinching roller (30).

9. An apparatus as claimed in any one of claims 6-8, wherein the clinching roller (30) is arranged outside the tube (33) being formed, and the counter roller (34) being arranged inside the tube (33) being formed.

10. An apparatus as claimed in any one of claims 6-9, wherein the clinching roller (30) and the counter roller (34) have shafts (31, 35), respectively, rotatably supported by the forming head (14).

11. An apparatus as claimed in any one of claims 6-10, further comprising means (38) for adjusting the clinching pressure between the rollers (30, 34).

12. An apparatus as claimed in any one of claims 5-11, wherein the deformation means (30, 34, 45) is arranged in connection with the forming head (14).

13. A helically-wound lock-seam tube which is helically formed from a metal strip (12) having longitudinal edge portions (16) which are interlocked in a helical lock seam (37), **characterised in that** the helically-wound lock seam (37) has deformations in the form of interspaced, expanded portions (41) which lock the interlocked edge portions (16) of the strip (12) in the lock seam (37).

14. A tube as claimed in claim 13, comprising at least one interlocking, expanded portion (41) on each helical turn of the lock seam (37).

15. A tube as claimed in claim 13 or 14, wherein the interlocking, expanded portions (41) are formed across the lock seam (37).

Patentansprüche

1. Verfahren zum Herstellen von Spiralnahtrohr aus einem Metallband (12) mit Längskantenabschnitten (16), das die folgenden Schritte umfasst: Zuführen des Bandes (12) zu einem Formkopf (14); Formen des Bandes (12) in Spiralform in dem Formkopf (14), wobei die Kantenabschnitte (16) des spiralartig geformten Bandes (12) miteinander in Kontakt gebracht werden; Zusammenpressen der miteinander in Kontakt befindlichen Kantenabschnitte (16) des Bandes-(12), um eine Spiralnaht (37) an einem Rohr (33) herzustellen, das in dem Formkopf (14) geformt wird; und Ausleiten des Spiralnahtrohrs (33) aus dem Formkopf (14); wobei beabstandete Verformungen (41) an der Naht (37) vorhanden sind, um die miteinander in Kontakt befindlichen Kantenabschnitte (16) des Bandes (12) in der Naht (37) ineinander eingreifen zu lassen, **dadurch gekennzeichnet, dass** die ineinander eingreifenden Verformungen als verlängerte, voneinander beabstandete Abschnitte (41) an der Naht (37) ausgebildet sind.

2. Verfahren nach Anspruch 1, wobei die ineinander eingreifenden, verlängerten Abschnitte (41) in einem Vorgang erzeugt werden, der in Verbindung mit dem Formkopf (14) ausgeführt wird.

3. Verfahren nach Anspruch 1 oder 2, wobei wenigstens ein eingreifender verlängerter Abschnitt (41) an jeder Spiralwindung der Naht (37) vorhanden ist.

4. Verfahren nach einem der vorangehenden Ansprüche, wobei die ineinander eingreifenden verlängerten Abschnitte (41) quer über die Naht (37) ausgebildet werden.

5. Vorrichtung zum Herstellen von Spiralnahtrohr aus einem Metallband (12) mit Längskantenabschnitten (16), die eine Einrichtung (11), die das Band (12) zu einem Formkopf (14) zuführt, eine Einrichtung, die das Band (12) in dem Formkopf (14) in Spiralform formt und die Kantenabschnitte (16) des spiralförmigen Bandes (12) miteinander in Kontakt bringt; eine Zusammenpress-Baugruppe (30, 34), die die miteinander in Kontakt befindlichen Kantenabschnitte (16) des Bandes (12) zusammenpresst, um eine Spiralnaht (37) an einem Rohr (33) herzustellen, das in dem Formkopf (14) geformt wird; eine Einrichtung, die das Spiralnahtrohr (33) aus dem Formkopf (14) herausleitet; und eine Einrichtung (30, 34, 40), die beabstandete Verformungen (41) an der Naht (37) erzeugt, um die in Kontakt befindlichen Kantenabschnitte (16) des Bandes (12) in der Spiralnaht (37) ineinander eingreifen zu lassen, **dadurch gekennzeichnet, dass** die Naht-Verformungseinrichtung (30, 34, 40) so ausgeführt ist, dass sie die ineinander eingreifenden Verformungen als verlängerte, voneinander beabstandete Abschnitte (41) an der Naht (37) ausbildet.

6. Vorrichtung nach Anspruch 5, wobei die Verformungseinrichtung (30, 34, 40) eine drehbare Zusammenpresswalze (30) mit einem Umfang und eine drehbare Gegenwalze (34) mit einem Umfang umfasst, wobei die Naht (37) zwischen den Umfängen der Walzen (30, 34) an einem Zusammenpresspunkt zusammengepresst wird und eine der Walzen (30) eine Einrichtung (40) an ihrem Umfang aufweist, mit der die ineinander eingreifenden verlängerten Abschnitte (41) an der Naht (37) an dem Zusammenpresspunkt erzeugt werden.

7. Vorrichtung nach Anspruch 6, wobei die Zusammenpresswalze (30) mit einer Umfangsnut (39) versehen ist, die wenigstens eine Vertiefung (40) zum Erzeugen der ineinander eingreifenden verlängerten Abschnitte (41) der Naht (37) umfasst.

8. Vorrichtung nach Anspruch 7, wobei die Vertiefung (40) quer zu der Umfangsnut (39) der Zusammenpresswalze (30) angeordnet ist.

9. Vorrichtung nach einem der Ansprüche 6-8, wobei die Zusammenpresswalze (30) außerhalb des Rohrs (33), das geformt wird, angeordnet ist und die Gegenwalze (34) innerhalb des Rohrs (33), das geformt wird, angeordnet ist.

10. Vorrichtung nach einem der Ansprüche 6-9, wobei die Zusammenpresswalze (30) und die Gegenwalze (34) jeweils Wellen (31, 35) aulweisen, die von dem Formkopf (14) drehbar getragen werden.

11. Vorrichtung nach einem der Ansprüche 6-10, die des Weiteren eine Einrichtung (38) umfasst, die den Zusammenpressdruck zwischen den Walzen (30, 34) reguliert.

12. Vorrichtung nach einem der Ansprüche 5-11, wobei die Verformungseinrichtung (30, 34, 45) in Verbindung mit dem Formkopf (14) angeordnet ist.

13. Spiralnahtrohr, das spiralartig aus einem Metallband (12) mit Längskantenabschnitten (16) geformt wird, die in einer Spiralnaht (37) ineinander eingreifen, **dadurch gekennzeichnet, dass** die Spiralnaht (37) Verformungen in Form beabstandeter, verlängerter Abschnitte (41) aufweist, die die ineinander eingreifenden Kantenabschnitte (16) des Bandes (12) in der Naht (37) fixieren.

14. Rohr nach Anspruch 13, das wenigstens einen eingreifenden, verlängerten Abschnitt (41) an jeder Spiralwindung der Naht (37) umfasst.

15. Rohr nach Anspruch 13 oder 14, wobei die ineinander eingreifenden, verlängerten Abschnitte (41) quer über die Naht (37) ausgebildet sind.

Revendications

1. Procédé de fabrication d'un tube à sertissage enroulé de manière hélicoïdale à partir d'une bande métallique (12) ayant des parties de bord longitudinal (16), comportant les étapes consistant à : avancer la bande (12) jusqu'à une tête de formage (14); former la bande (12) en une forme d'hélice dans la tête de formage (14), de sorte que les parties de bord (16) de la bande formée en hélice (12) sont amenées en engagement l'une avec l'autre; sertir les parties de bord en engagement (16) de la bande (12) afin de former un sertissage enroulé de manière hélicoïdale (37) sur un tube (33) formé dans la tête de formage (14); et avancer le tube à sertissage enroulé de manière hélicoïdale (33) hors de la tête de formage (14) ; des déformations espacées (41) étant prévues sur le sertissage (37) afin de bloquer les parties de bord en engagement (16) de la bande (12) dans le sertissage (37), **caractérisé en ce que** les déformations de blocage sont sous la forme de parties espacées et agrandies (41) le long du sertissage (37).

2. Procédé selon la revendication 1, dans lequel les parties agrandies de blocage (41) sont prévues dans une opération réalisée en liaison avec la tête de formage (14).

3. Procédé selon la revendication 1, dans lequel au moins une partie agrandie de blocage (41) est prévue sur chaque tour hélicoïdal du sertissage (37).

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel les parties agrandies de blocage (41) sont formées sur le sertissage (37).

5. Appareil pour la fabrication d'un tube à sertissage enroulé de manière hélicoïdale à partir d'une bande métallique (12) ayant des parties de bord longitudinal (16), comportant des moyens (11) destinés à avancer la bande (12) jusqu'à une tête de formage (14); des moyens destinés à former la bande (12) en une forme hélicoïdale dans la tête de formage (14) et destinée à amener les parties de bord (16) de la bande formée en hélice (12) en engagement l'une avec l'autre; un ensemble de sertissage (30, 34) destiné à sertir les parties de bord en engagement (16) de la bande (12) afin de former un sertissage enroulé de manière hélicoïdale (37) sur un tube (33) formé dans la tête de formage (14); des moyens destinés à avancer le tube à sertissage enroulé de manière hélicoïdale (33) hors de la tête de formage (14); et des moyens (30, 34, 40) destinés à procurer des déformations espacées (41) sur le sertissage (37) afin de bloquer les parties de bord en engagement (16) de la bande (12) dans le sertissage (37), **caractérisé en ce que** lesdits moyens de déformation de sertissage (30, 34, 40) sont configurés afin de former les déformations de blocage sous forme de parties espacées et agrandies (41) le long du sertissage (37).

6. Appareil selon la revendication 5, dans lequel les moyens de déformation (30, 34, 40) comportent un rouleau de sertissage rotatif (30) ayant une périphérie et un rouleau opposé rotatif (34) ayant une périphérie, le sertissage (37) étant serti entre les périphéries des rouleaux (30, 34) au niveau d'un point de sertissage, et chacun des rouleaux (30) ayant des moyens (40) sur sa périphérie afin de procurer les parties agrandies de blocage (41) sur le sertissage (37) au niveau dudit point de sertissage.

7. Appareil selon la revendication 6, dans lequel le rouleau de sertissage (30) est pourvu d'une rainure périphérique (39) qui comprend au moins un renfoncement (40) destiné à procurer les parties agrandies de blocage (41) du sertissage (37).

8. Appareil selon la revendication 7, dans lequel le renfoncement (40) est disposé transversalement à la rainure périphérique (39) du rouleau de sertissage (30).

9. Appareil selon l'une quelconque des revendications 6 à 8, dans lequel le rouleau de sertissage (30) est disposé à l'extérieur du tube (33) qui est formé, et le rouleau opposé (34) est disposé à l'intérieur du

tube (33) qui est formé.

10. Appareil selon l'une quelconque des revendications 6 à 9, dans lequel le rouleau de sertissage (30) et le rouleau opposé (34) possèdent des arbres (31, 35) respectivement supportés de façon rotative par la tête de formage (14).

11. Appareil selon l'une quelconque des revendications 6 à 10, comportant en outre des moyens (38) destinés à ajuster la pression de sertissage entre les rouleaux (30, 34).

12. Appareil selon l'une quelconque des revendications 5 à 11, dans lequel les moyens de déformation (30, 34, 45) sont disposés en liaison avec la tête de formage (14).

13. Tube à sertissage enroulé de manière hélicoïdale qui est formé en hélice à partir d'une bande métallique (12) ayant des parties de bord longitudinal (16) qui sont bloquées dans un sertissage hélicoïdal (37), **caractérisé en ce que** le sertissage enroulé de manière hélicoïdale (37) a des déformations sous la forme de parties espacées et agrandies (41) qui bloquent les parties de bord bloquées (16) de la bande (12) dans le sertissage (37).

14. Tube selon la revendication 13, comportant au moins une partie agrandie de blocage (41) sur chaque tour hélicoïdale du sertissage (37).

15. Tube selon la revendication 13 ou 14, dans lequel les parties agrandies de blocage (41) sont formées sur le sertissage (37).

FIG.1

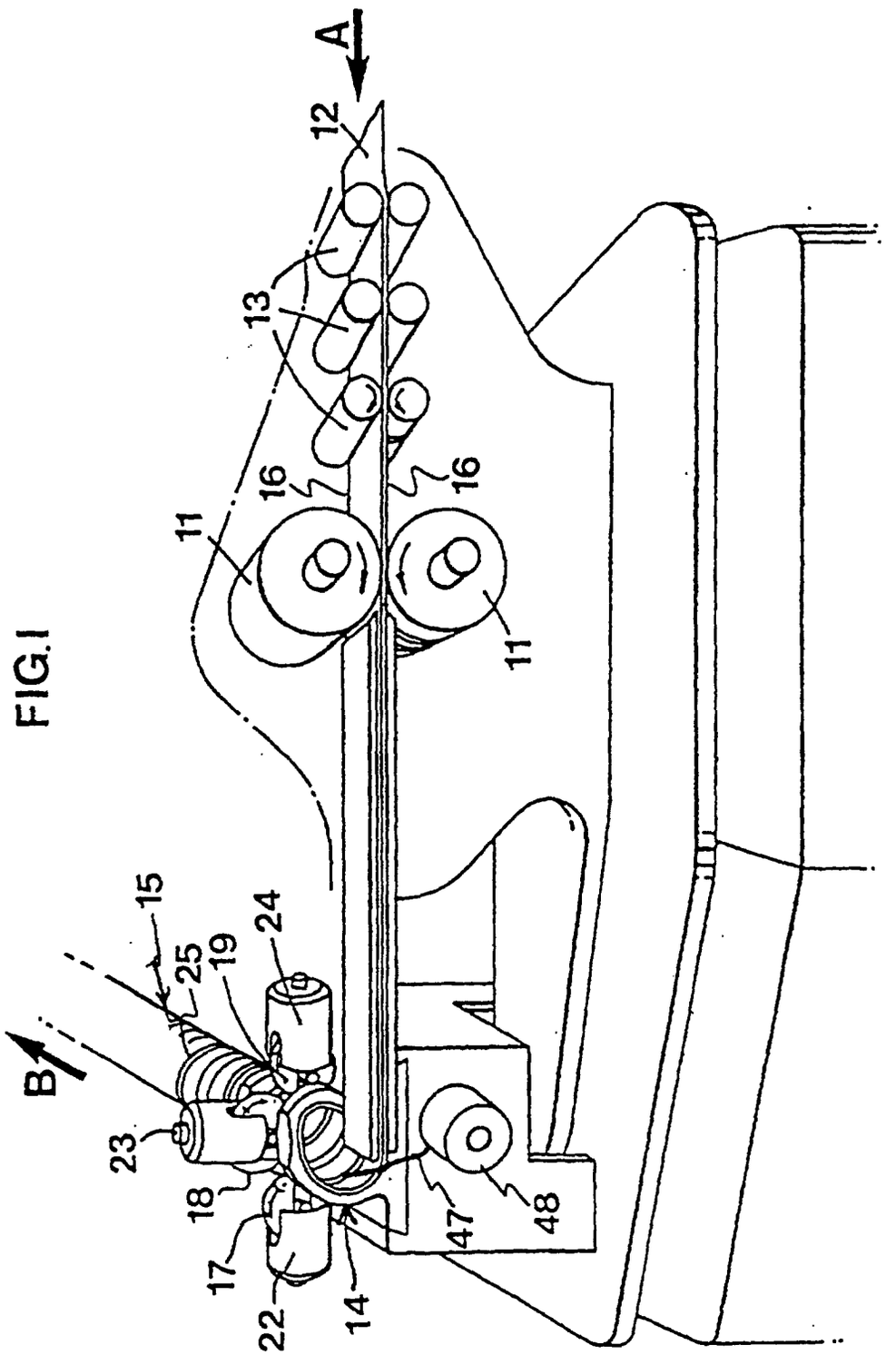

FIG. 2

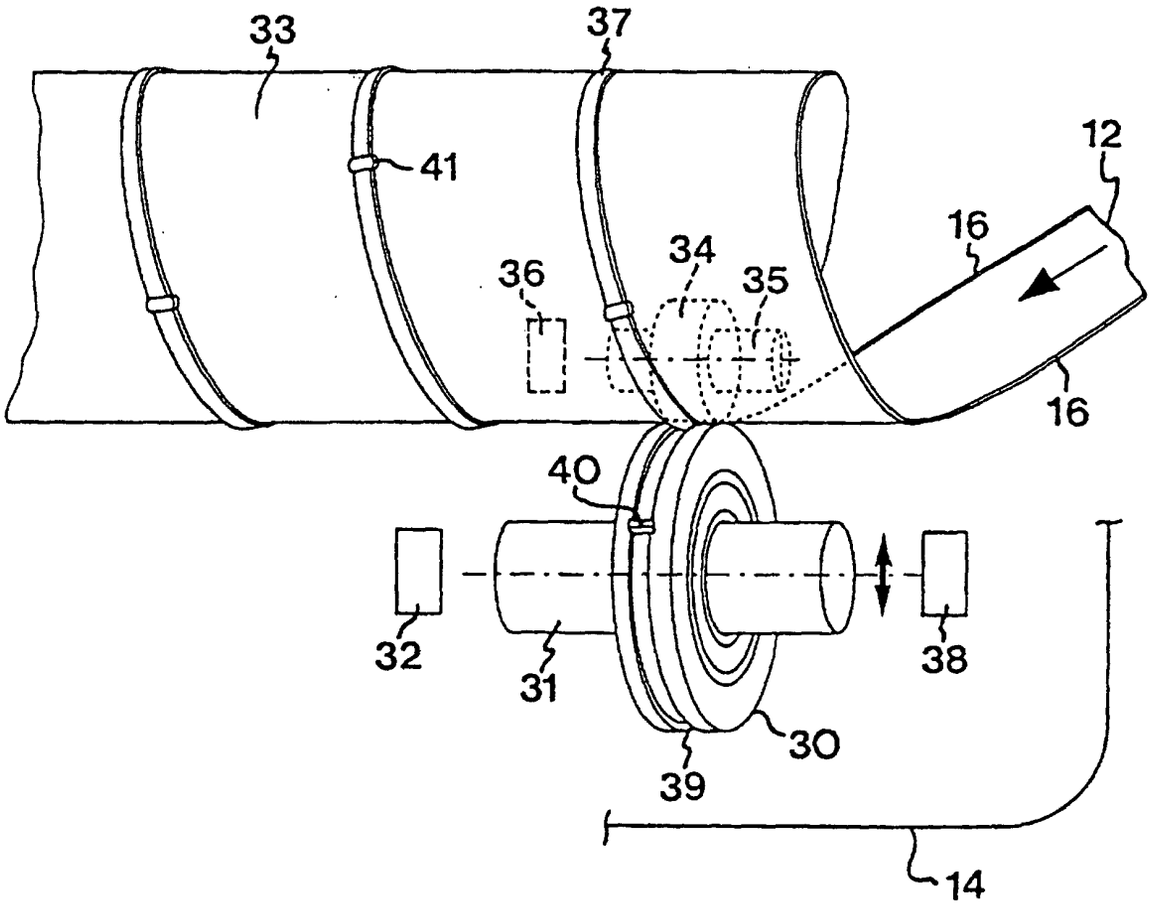

FIG.5

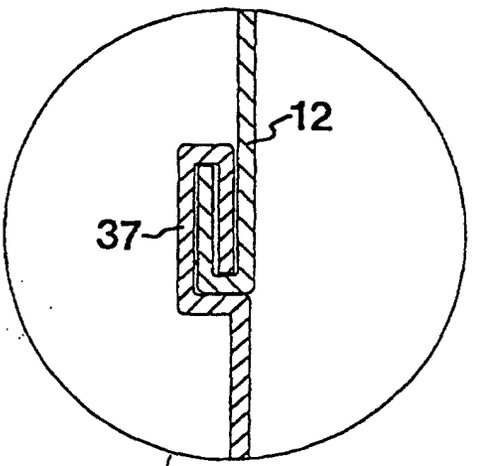

FIG.3

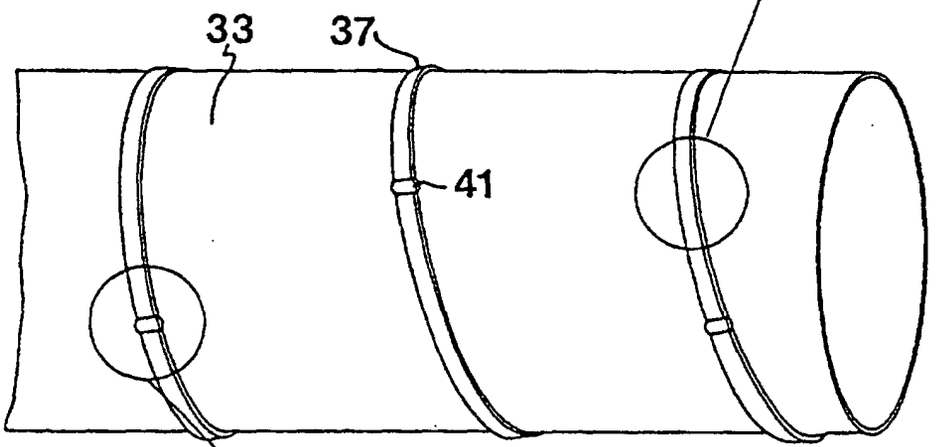

FIG.4

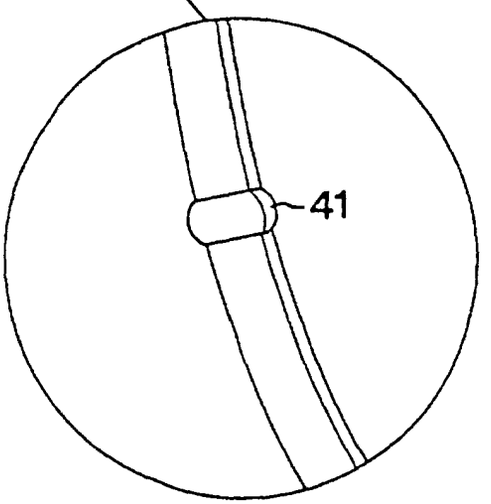

FIG.6

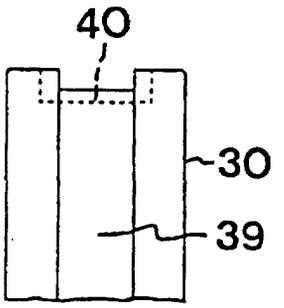

FIG.7

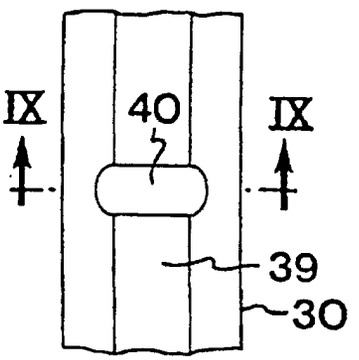

FIG.8

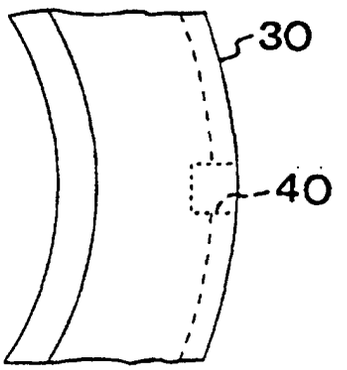

FIG.9