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

VERFAHREN UND VORRICHTUNG ZUM HERSTELLEN VON GEWALZTEN
SCHRAUBENNAHTROHREN MIT WENIGER SCHMIERSTOFF

PROCEDE ET EQUIPEMENT DE PRODUCTION DE TUBES A AGRAFAGE HELICOIDAL, AVEC
LUBRIFICATION REDUITE

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• **DERWENT'S ABSTRACT, No. 18100C/10, week**
8010; & SU,A,671 897 (VANINSKII V M), 10 July
1979.

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the production of helically-wound lock-seam tubing, and more specifically concerns a method and an apparatus for such production with a reduced need of lubrication.

BACKGROUND ART

[0002] Known machines for producing helically-wound lock-seam tubing are disclosed by, for example, British Patent Publication GB 2,213,748 and US Patent No. 4,706,481. These machines are well-known to the person skilled in the art and thus need not to be described in any detail here. Several further developments of such machines are available on the market, but these machines still suffer from certain drawbacks, as will be discussed in the following.

[0003] The metal strip used for the production in question is normally coated with zinc in order to be able to withstand corrosion. The metal strip is thus galvanised, which leads to problems that are well-known to the skilled person.

[0004] When the metal strip is edge-formed in the roller assembly preceding the forming head, small fragments of zinc are released from the metal strip and adhere to the edge-forming rollers. Owing to these zinc fragments, the diameter of the edge-forming rollers increases, especially in the last pair of rollers. Since these rollers are not resiliently journalled, the clamping force in the nip between two rollers is considerably increased as a result of the build-up of zinc on the rollers. In severe cases, these undesirable forces are so significant that the rollers are broken, which causes stoppages of production.

[0005] Another problem is that zinc fragments are released as a result of the sliding of the metal strip between the guiding plates before the forming head, which leads to a build-up of zinc on the opposite faces of these guiding plates. If the build-up of zinc on the guiding plates is too considerable, the feeding of the metal strip between the guiding plates can be disturbed.

[0006] Another disadvantage is that the zinc coating on the metal strip is softened and adheres to the inside of the forming head owing to significant frictional forces and heat development in the forming head. This renders more difficult the forming of the tubing in the forming head.

[0007] Hitherto, the problems related to the released zinc fragments have been solved by supplying lubricant, normally oil, to the metal strip on different places in the machine. For example, such lubrication is discussed in US Patent No. 2,136,943. Lubrication of metal strips is also discussed in US Patent No. 3,750,439 and the Russian Publication No. 835,558.

[0008] In most machines available on today's market,

the oil is, however, supplied to the metal strip in a very simple manner. Traditionally, the lower roller of the first pair of rollers in the edge-forming assembly is permanently immersed in oil in a trough, by means of which oil is supplied over the total width of the metal strip. However, this arrangement suffers from several drawbacks, as will be discussed below.

[0009] As the roller immersed in oil in the oil trough rotates, oil is spread to the upper surface of the metal strip, which later will form the inside of the tube. The finished tubes are thus covered with oil on both the inside and the outside, which has unfavourable consequences.

[0010] If the tubes are used in ventilation duct systems, dust and other particles accumulate on the inside of the tube, which in turn becomes the breeding-ground of bacteria, virus, mould and the like, which may be dangerous to people's health. Further, accumulated dirt on the inside of the tube causes reduction of the tube inner cross-section with the consequence that the air flow rates and ventilation efficiencies for which the tube was originally designed are no longer upheld.

[0011] Similarly, dust and other particles accumulate on the outside of the tubes, making them unpleasant to handle for the personnel. Further, the tubes have to be cleaned on the outside if they are to be painted.

[0012] During transportation, tubes of smaller diameter are often inserted in tubes of greater diameter in order to save space. Oil on the outside of the smaller tubes is then transferred to the inside of the bigger tubes.

[0013] A special disadvantage is that an excess of oil in the lock seam may cause the tube to "spin" or slide during transportation and handling. As a result of such a spin, the tube diameter increases and consequently the sealing is impaired and standard components cannot be fitted on the tube.

[0014] In recent years, the demand for oil-free, helically-wound lock-seam tubing has increased, and the finding of a solution to the above-mentioned problems is therefore of great interest.

SUMMARY OF THE INVENTION

[0015] It is therefore an object of the present invention, starting from a method and an apparatus according to the preambles of claims 1 and 4 (see US 2 136 943 A), to remedy the above-mentioned drawbacks by providing a method and an apparatus for producing helically-wound lock-seam tubing using a minimum of lubricants.

[0016] A further object of the invention is to provide the production of helically-wound lock-seam tubes which are pleasant to handle for the personnel.

[0017] Another object of the invention is to provide a method and an apparatus which are easily adapted to existing machines. The tubing produced in accordance with the invention may, for example, be used in ventilation duct systems.

[0018] These objects are achieved by a method as set forth in the appended independent claim 1, preferred variants thereof being defined in subclaims 2-3.

[0019] The above objects are also achieved by an apparatus as set forth in the appended independent claim 4, preferred embodiments thereof being defined in subclaims 5-9.

[0020] Practical tests of the invention using oil as lubricant have yielded excellent results. Compared with conventional production in accordance with the above description of the background art, the oil on the outside of the finished tube has been reduced by at least 25%, and the inside of the tube is almost free from oil. Since no oil trough is used and much less oil is spread, the surroundings of the machine are much more pleasant for the operator.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The invention will now be described in more detail with reference to the accompanying drawings showing preferred embodiments of the invention. In the drawings,

Fig. 1 schematically illustrates an embodiment of the apparatus according to the invention,

Fig. 2 shows a cross-section of the metal strip before the edge-forming assembly,

Fig. 3 is a view similar to Fig. 2 but shows another embodiment of the lubricant-supplying means, and

Fig. 4 shows a cross-section of the metal strip after the edge-forming assembly.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0022] As shown in Fig. 1, drive rollers 11 feed a metal strip 12 (arrow A) through an edge-forming assembly having rolls 13, by which longitudinal edge portions 16a, 16b are formed. The metal strip 12 is formed and helically wound in a forming head 14 in a known manner for producing a tube 15. The forming head 14 has clinching rollers 17-19 for forming a lock seam 25 on the tube 15 fed out of the forming head 14 (arrow B). A pair of guiding plates 20 are arranged between the drive rollers 11 and the forming head 14, as is conventional.

[0023] A conduit 30 for supplying a lubricant, for example oil, to the metal strip 12 is arranged under the edge-forming assembly 13. The conduit 30 is connected to an oil supply 31. Optionally, a similar oil conduit 32 and an oil supply 33 may be arranged after the drive rollers 11, as will be discussed below.

[0024] As can be seen in Fig. 2, the oil conduit 30 is disposed at the edge portion 16a, which in the edge-forming assembly 13 is given the shape of a Z (see Fig. 4). The oil conduit 30 has a supply opening 34, which is either applied to the strip 12 or disposed at a short distance therefrom.

[0025] In the embodiment shown in Fig. 3, the supply

opening 34 of the oil conduit 30 is disposed at a greater distance from the metal strip 12, but there is a brush member 35 provided at the end of the conduit 30. The brush member 35 is in permanent engagement with the metal strip 12 and compensates for any vertical movements of the strip 12 in production.

[0026] Fig. 4 shows the Z-shaped edge portion 16a and the L-shaped edge portion 16b, which are formed in the edge-forming assembly.

[0027] Since oil is supplied locally and only on that side of the strip 12 which forms the outside of the tube 15, the finished tube 15 is almost free from oil on the inside. As is clearly understood from Figs 2 and 3, oil is applied to the strip 12 over only a very limited portion of the width of the strip 12. No oil is spread to the upper side of the strip 12.

[0028] In order to ensure that no zinc fragment build-up takes place on the inside of the guiding plates 20, a corresponding oil supply assembly 32, 33 may optionally be provided after the drive rollers 11. The oil conduit 32 has an opening 36 disposed in a corresponding opening in the lower guiding plate 20.

[0029] In order to further reduce the amount of oil on the strip 12, scraper means 40-43 can be provided before, in connection with and after the forming head 14. In practice, the scraper 40 comprises rubber lips (not shown) gripping around the edge portions 16a, 16b of the strip 12. Preferably, the scraper 41 on the forming head 14 also has rubber lips (not shown), whereas the scraper 42 arranged in an opening (not shown) of the forming head 14 has means (for example of paper) for absorbing oil. The scraper 43 arranged on the outside of the tube 15 can be of any suitable type, preferably a rubber lip member.

[0030] Finally, it should be mentioned that the invention is by no means restricted to the embodiments described herein, but that several modifications are conceivable within the inventive concept and the scope of the appended claims. For example, the apparatus can be provided with further scraper and wiper means for the removal of oil. Further, the brush member can be of any other suitable design.

Claims

1. A method for producing helically-wound lock-seam tubing (15) from a metal strip (12) having longitudinal edge portions (16a, 16b), comprising the steps of: feeding the strip (12) to a forming head (14); forming the strip (12) into helical shape in the forming head (14), whereby the edge portions (16a, 16b) of the helically-formed strip (12) are brought into engagement with each other; clinching the engaging edge portions (16a, 16b) of the strip (12) to form a helically-wound lock seam (25) on a tube (15) formed in the forming head (14); and feeding the helically-wound lock-seam tube (15) out of the form-

- ing head (14); **characterised** in that, before the forming head (14), a lubricant is supplied locally on that side of the strip (12) which forms the outside of the tube (15), the lubricant being supplied over only a limited portion of the width of the strip (12), wherein the lubricant is supplied to the strip (12) at a point adjacent to one of the edge portions (16a) of the strip (12).
2. A method as claimed in claim 1, wherein the edge portions (16a, 16b) of the strip (12) are edge-formed in an edge-forming assembly (13) preceding the forming head (14), the lubricant being supplied to the strip (12) before the edge-forming assembly (13).
 3. A method as claimed in claim 2, wherein a first one of the edge portions (16a) of the strip (12) is edge-formed in such a way that a partial cross-section through the first edge portion (16a) of the strip (12) is Z-shaped, whereas a second one of the edge portions (16b) of the strip (12) is edge-formed in such a way that a partial cross-section through this second portion (16b) of the strip (12) is L-shaped, the lubricant being supplied to the strip (12) adjacent to the Z-shaped edge portion (16a).
 4. An apparatus for producing helically-wound lock-seam tubing (15) from a metal strip (12) having longitudinal edge portions (16a, 16b), comprising means (11) for feeding the strip (12) to a forming head (14); means for forming the strip (12) into helical shape in the forming head (14) and for bringing the edge portions (16a, 16b) of the helically-wound strip into engagement with each other; a clinching assembly (17-19) for clinching the engaging edge portions (16a, 16b) of the strip (12) to form a helically-wound lock seam (25) on a tube (15) formed in the forming head (14); and means for feeding the helically-wound lock-seam tube (15) out of the forming head (14); **characterised** by means (30, 34), arranged before the forming head (14), for locally supplying a lubricant to that side of the strip (12) which forms the outside of the tube (15), the lubricant being supplied over only a limited portion of the width of the strip (12), wherein the lubricant-supplying means (30, 34) comprises a conduit (30) with a supply opening (34) disposed adjacent to one of the edge portions (16a) of the strip (12).
 5. An apparatus as claimed in claim 4, wherein the opening (34) of the lubricant-supplying conduit (30) is applied to the strip (12).
 6. An apparatus as claimed in claim 4, wherein the opening (34) of the lubricant-supplying conduit (30) is disposed at a distance from the strip (12).
 7. An apparatus as claimed in claim 6, wherein the lubricant-supplying conduit (30) has a brush member (35) which is provided at said opening (34) and which is in permanent engagement with the strip (12).
 8. An apparatus as claimed in any one of claims 4-7, further comprising an assembly (13) for forming said edge portions (16a, 16b) before the forming head (14), the lubricant-supplying means (30, 34) being arranged before the edge-forming assembly (13).
 9. An apparatus as claimed in claim 8, wherein the edge-forming assembly (13) comprises means for forming a first one of the edge portions (16a) of the strip (12) in such a way that a partial cross-section through this first edge portion (16a) is Z-shaped, the edge-forming assembly (13) further comprising means for forming a second one of the edge portions (16b) of the strip (12) in such a way that a partial cross-section through this second edge portion (16b) of the strip (12) is L-shaped, the lubricant-supplying means (30, 34) being so arranged that lubricant is supplied to the strip (12) adjacent to the first Z-shaped edge portion (16a).

Patentansprüche

1. Verfahren zum Herstellen von Spiralfalzrohren (15) aus einem Metallband (12) mit Längskantenabschnitten (16a, 16b), das die folgenden Schritte umfasst: Transportieren des Bandes (12) zu einem Formkopf (14); Formen des Bandes (12) in eine Spiralfaltform in dem Formkopf (14), wobei die Kantenabschnitte (16a, 16b) des spiralförmigen Bandes (12) miteinander in Kontakt gebracht werden; Falzen der miteinander in Kontakt befindlichen Kantenabschnitte (16a, 16b) des Bandes (12), um einen Spiralfalz (25) an einem Rohr (15) herzustellen, das in dem Formkopf (14) geformt wurde; und Transportieren des Spiralfalzrohres (15) aus dem Formkopf (14) heraus; **dadurch gekennzeichnet, dass** vor dem Formkopf (14) örtlich begrenzt ein Schmiermittel auf die Seite des Bandes (12) zugeführt wird, die die Außenseite des Rohrs (15) bildet, wobei das Schmiermittel nur auf einem begrenzten Abschnitt des Bandes (12) zugeführt wird und das Schmiermittel dem Band (12) an einem Punkt angrenzend an einen der Kantenabschnitte (16a) des Bandes (12) zugeführt wird.
2. Verfahren nach Anspruch 1, wobei die Kantenabschnitte (16a, 16b) des Bandes (12) in einer Abkantbaugruppe (13) vor dem Formkopf (14) abgekantet werden und das Schmiermittel dem Band (12) vor der Abkantbaugruppe (13) zugeführt wird.

3. Verfahren nach Anspruch 2, wobei ein erster der Kantenabschnitte (16a,16b) des Bandes (12) so abgekantet wird, dass ein Teilquerschnitt des ersten Kantenabschnitts (16a) des Bandes (12) Z-förmig ist, während ein zweiter der Kantenabschnitte (16b) des Bandes (12) so abgekantet wird, dass ein Teilquerschnitt dieses zweiten-Abschnitts (16b) des Bandes (12) L-förmig ist, wobei das Schmiermittel dem Band (12) an den Z-förmigen Kantenabschnitt (16a) angrenzend zugeführt wird. 5 10
4. Vorrichtung zum Herstellen von Spiralfalzrohren (15) aus einem Metallband (12) mit Längskantenabschnitten (16a,16b), die Einrichtungen (11), mit denen das Band (12) zu einem Formkopf (14) transportiert wird; Einrichtungen, mit denen das Band (12) in dem Formkopf (14) in Spiralform gebracht wird und die Kantenabschnitte (16a,16b) des spiralförmig gewickelten Bandes miteinander in Eingriff gebracht werden; eine Falzbaugruppe (17-19), mit der die in Eingriff befindlichen Kantenabschnitte (16a,16b) des Bandes (12) gefalzt werden, um einen Spiralfalz (25) an einem Rohr (15) herzustellen, das in dem Formkopf (14) geformt wurde; sowie Einrichtungen umfasst, mit denen das Spiralfalzrohr (15) aus dem Formkopf (14) transportiert wird, **gekennzeichnet** durch Einrichtungen (30,34), die vor dem Formkopf (14) angeordnet sind, und mit denen der Seite des Bandes (12), die die Außen-seite des Rohres (15) bildet, ein Schmiermittel zugeführt wird, wobei das Schmiermittel nur über einen begrenzten Abschnitt der Breite des Bandes (12) zugeführt wird und die Schmiermittel-Zuführ-einrichtung (30,34) eine Leitung (30) mit einer Zu-führöffnung (34) umfasst, die an einen der Kanten-abschnitte (16a) des Bandes (12) angrenzend an-geordnet ist. 15 20 25 30 35
5. Vorrichtung nach Anspruch 4, wobei die Öffnung (34) der Schmiermittel-Zuführleitung (30) auf dem Band (12) aufliegt. 40
6. Vorrichtung nach Anspruch 4, wobei die Öffnung (34) der Schmiermittel-Zuführleitung (30) von dem Band (12) beabstandet ist. 45
7. Vorrichtung nach Anspruch 6, wobei die Schmiermittelzuführleitung (30) ein Bürstenelement (35) aufweist, das an der Öffnung (34) angeordnet ist und das in ständigem Kontakt mit dem Band (12) ist. 50
8. Vorrichtung nach einem der Ansprüche 4-7, die des Weiteren eine Baugruppe (13) umfasst, mit der die Kantenabschnitte (16a,16b) vor dem Formkopf (14) geformt werden, wobei die Schmiermittel-Zuführ-einrichtung (30,34) vor der Abkantbaugruppe (13) angeordnet ist. 55

9. Vorrichtung nach Anspruch 8, wobei die Abkantbaugruppe (13) eine Einrichtung umfasst, mit der ein erster der Kantenabschnitte (16a) des Bandes (12) so geformt wird, dass ein Teilquerschnitt dieses ersten Kantenabschnitts (16a) Z-förmig ist, und wobei die Abkantbaugruppe (13) des Weiteren eine Einrichtung umfasst, mit der ein zweiter der Kantenabschnitte (16b) des Bandes (12) so geformt wird, dass ein Teilquerschnitt dieses zweiten Kantenabschnitts (16b) des Bandes (12) L-förmig ist, wobei die Schmiermittel-Zuführeinrichtung (30,34) so angeordnet ist, dass Schmiermittel dem Band (12) an den ersten Z-förmigen Kantenabschnitt (16a) angrenzend zugeführt wird.

Revendications

1. Procédé de fabrication d'un tube serti enroulé de manière hélicoïdale (15) à partir d'une bande métallique (12) ayant des parties de bord longitudinales (16a, 16b), comportant les étapes consistant à : avancer la bande (12) jusqu'à une tête de formage (14); former la bande (12) avec une forme hélicoïdale dans la tête de formage (14), de sorte que les parties de bord (16a, 16b) de la bande formée de manière hélicoïdale (12) sont amenées en engagement l'une avec l'autre; sertir les parties de bord d'engagement (16a, 16b) de la bande (12) afin de former un sertissage enroulé de manière hélicoïdale (25) sur un tube (15) formé dans la tête de formage (14); et avancer le tube serti enroulé de manière hélicoïdale (15) hors de la tête de formage (14); caractérisé en ce que, avant la tête de formage (14), un lubrifiant est délivré localement sur le côté de la bande (12) qui forme l'extérieur du tube (15), le lubrifiant étant délivré seulement sur une partie limitée de la largeur de la bande (12), le lubrifiant étant délivré à la bande (12) en un point adjacent à l'une des parties de bord (16a) de la bande (12).
2. Procédé selon la revendication 1, dans lequel les parties de bord (16a, 16b) de la bande (12) sont formées au niveau des bords dans un ensemble de formage de bord (13) qui précède la tête de formage (14), le lubrifiant étant délivré à la bande (12) avant l'ensemble de formage de bord (13).
3. Procédé selon la revendication 2, dans lequel une première des parties de bord (16a) de la bande (12) est formée au niveau du bord d'une manière telle qu'une section partielle à travers la première partie de bord (16a) de la bande (12) est en forme de Z, alors qu'une deuxième des parties de bord (16b) de la bande (12) est formée au niveau du bord d'une manière telle qu'une section partielle à travers cette deuxième partie (16b) de la bande (12) est en forme de L, le lubrifiant étant délivré à la bande (12) de

façon adjacente à la partie de bord en forme de Z (16a).

4. Appareil destiné à produire un tube serti enroulé de manière hélicoïdale (15) à partir d'une bande métallique (12) ayant des parties de bord longitudinales (16a, 16b), comportant des moyens (11) destinés à délivrer la bande (12) à une tête de formage (14); des moyens destinés à former la bande (12) avec une forme hélicoïdale dans la tête de formage (14) et destinés à amener les parties de bord (16a, 16b) de la bande enroulée de manière hélicoïdale en engagement l'une avec l'autre; un ensemble de sertissage (17 à 19) destiné à sertir les parties de bord en engagement (16a, 16b) de la bande (12) afin de former un sertissage enroulé de manière hélicoïdale (25) sur un tube (15) formé dans la tête de formage (14); et des moyens destinés à avancer le tube serti enroulé de manière hélicoïdale (15) hors de la tête de formage (14); caractérisé par des moyens (30, 34), disposés avant la tête de formage (14), destinés à délivrer localement un lubrifiant sur le côté de la bande (12) qui forme l'extérieur du tube (15), le lubrifiant étant délivré sur une partie limitée seulement de la largeur de la bande (12), les moyens d'alimentation en lubrifiant (30, 34) comportant un conduit (30) avec une ouverture d'alimentation (34) disposée de façon adjacente à l'une des parties de bord (16a) de la bande (12). 5 10 15 20 25 30
5. Appareil selon la revendication 4, dans lequel l'ouverture (34) du conduit d'alimentation en lubrifiant (30) est appliquée sur la bande (12).
6. Appareil selon la revendication 4, dans lequel l'ouverture (34) du conduit d'alimentation en lubrifiant (30) est disposée à une distance de la bande (12). 35
7. Appareil selon la revendication 6, dans lequel le conduit d'alimentation en lubrifiant (30) possède un élément de brosse (35) qui est prévu au niveau de ladite ouverture (34) et qui est en engagement permanent avec la bande (12). 40 45
8. Appareil selon l'une quelconque des revendications 4 à 7, comportant en outre un ensemble (13) destiné à former lesdites parties de bord (16a, 16b) avant la tête de formage (14), les moyens d'alimentation en lubrifiant (30, 34) étant disposés avant l'ensemble de formage de bord (13). 50
9. Appareil selon la revendication 8, dans lequel l'ensemble de formage de bord (13) comporte des moyens destinés à former une première des parties de bord (16a) de la bande (12) d'une manière telle qu'une section partielle à travers cette première partie de bord (16a) est en forme de Z, l'ensemble 55

de formage de bord (13) comportant en outre des moyens destinés à former une deuxième des parties de bord (16b) de la bande (12) d'une manière telle qu'une section partielle à travers cette deuxième partie de bord (16b) de la bande (12) est en forme de L, les moyens d'alimentation en lubrifiant (30, 34) étant disposés de telle sorte que le lubrifiant est délivré à la bande (12) de façon adjacente à la première partie de bord (16a) en forme de Z.

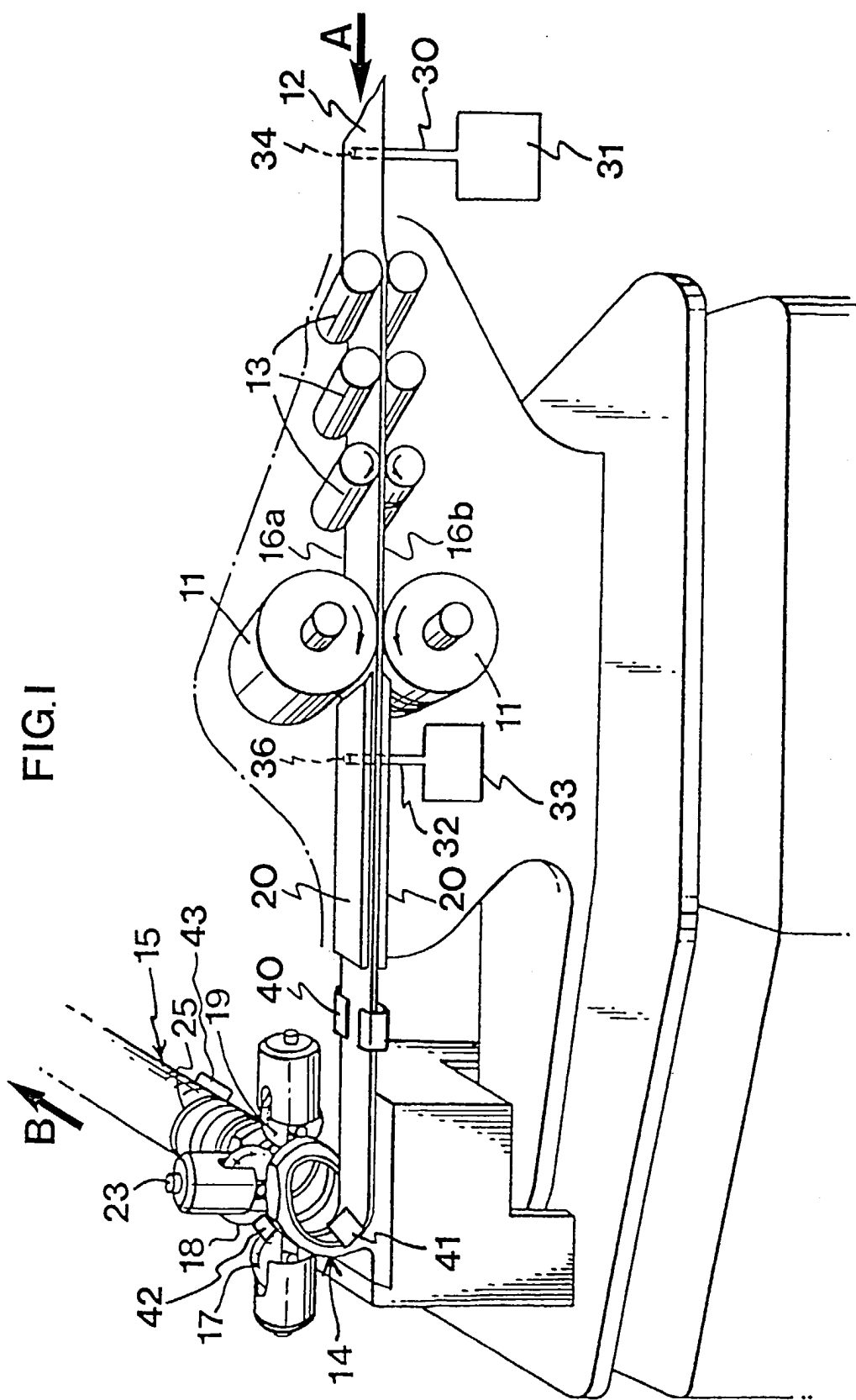


FIG.2

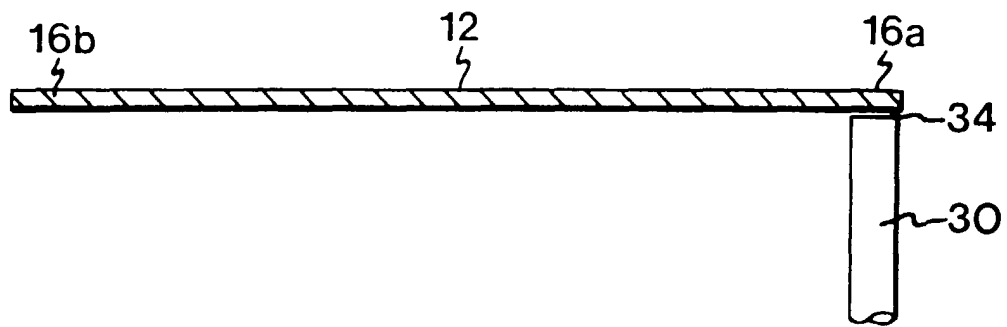


FIG.3

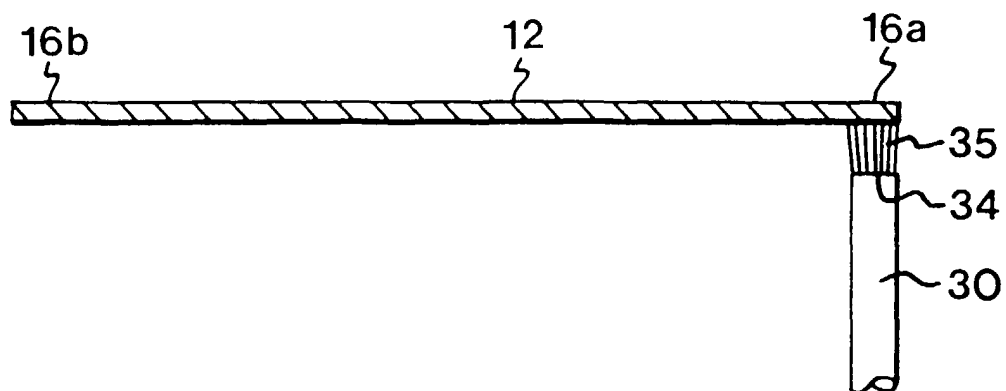


FIG.4

