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

(11) **EP 1 620 253 B9**

(12) **CORRECTED EUROPEAN PATENT SPECIFICATION**

(15) Correction information:
Corrected version no 1 (W1 B1)
Corrections, see
Description Paragraph(s) 8, 11

(48) Corrigendum issued on:
18.03.2009 Bulletin 2009/12

(45) Date of publication and mention of the grant of the patent:
28.05.2008 Bulletin 2008/22

(21) Application number: **04729058.0**

(22) Date of filing: **23.04.2004**

(51) Int Cl.:
B31F 1/30 *(2006.01)*

(86) International application number:
PCT/EP2004/004331

(87) International publication number:
WO 2004/098867 (18.11.2004 Gazette 2004/47)

(54) **AUTOMATIC MACHINE FOR PRODUCING CORRUGATED SHEET--LIKE ELEMEN TS, PARTICULARLY FOR PACKAGING, THERMAL INSULATION, SOUNDPROOFING, AND THE LIKE**

AUTOMATISCHE VORRICHTUNG ZUR HERSTELLUNG VON GEWELLTEN BAHNENMATERIAL, INSBESONDERE FÜR VERPAKKUNG, WÄRMEDÄMMUNG, SCHALLDÄMPFUNG USW.

MACHINE AUTOMATIQUE DE PRODUCTION D'ELEMENTS DE TYPE FEUILLE ONDULEE DESTINES NOTAMMENT A L'EMBALLAGE, L'ISOLATION THERMIQUE, L'ISOLATION PHONIQUE ET ANALOGUE

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR

(30) Priority: **08.05.2003 IT MI20030930**

(43) Date of publication of application:
01.02.2006 Bulletin 2006/05

(73) Proprietor: **Interwave S.r.l**
24100 Bergamo BG (IT)

(72) Inventors:
- **GRITTI, Fabio, Angelo**
  24055 Cologno Al Serio (IT)
- **GRITTI, Roberto**
  24055 Cologno Al Serio (IT)

(74) Representative: **Alagem Modiano, Lara S. et al**
Modiano & Associati
Via Meravigli, 16
20123 Milano (IT)

(56) References cited:
EP-A- 0 338 826
CH-A- 37 095
DE-A- 1 561 516
DE-C- 556 985
FR-A- 1 373 515
US-A- 2 166 749
US-A- 3 904 473
US-A- 4 264 390
US-A- 5 961 778

EP 1 620 253 B9

Description

Technical Field

[0001] The present invention relates to an automatic machine for producing corrugated sheet-like elements, particularly for packaging, thermal insulation, soundproofing and the like.

Background Art

[0002] Patent GB 1110287 discloses a sheet made of thermoplastic resin, which is extruded with a corrugated profile and on which corrugations are provided in a direction that is substantially parallel to the extrusion direction.

[0003] A substantially flat sheet is connected to the resulting corrugated sheet, for example by lamination; such flat sheet can be made of the most disparate materials and can be obtained for example by means of expanded plastic material.

[0004] This embodiment has the drawback of producing a manufactured article that is difficult to store, since the coupled sheet that is provided cannot be rolled up because the corrugations lie substantially parallel to the longitudinal extension of the ribbon.

[0005] Because of this problem, the article in this embodiment has not achieved an acceptable diffusion among users, since it was not practically possible to perform industrial-level production.

[0006] FR-A-1,373,515 discloses a machine and method for making a corrugated product.

Disclosure of the Invention

[0007] The aim of the invention is to solve the problem described above, by providing an automatic machine that allows to provide corrugated sheet-like elements automatically, providing a continuous and industrially valid production.

[0008] Within this aim, an object of the invention is to provide an automatic machine that allows to continuously connect a corrugated sheet-like element to at least one flat sheet-like element, leading directly to a finished manufactured article that can be stored in relatively limited spaces.

[0009] Another object of the present invention is to provide an automatic machine that thanks to its particular constructive characteristics is capable of giving the greatest assurances of reliability and safety in use.

[0010] Another object of the present invention is to provide an automatic machine that can be easily obtained starting from commonly commercially available elements and materials and is also competitive from a merely economical standpoint.

[0011] This aim and these and other objects that will become better apparent hereinafter are achieved by an automatic machine for producing corrugated sheet-like elements, particularly for packaging, thermal insulation, soundproofing and the like, according to the invention, as claimed in claim 1 and a method using this machine as claimed in claim 20.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Further characteristics and advantages of the present invention will become better apparent from the description of a preferred but not exclusive embodiment of an automatic machine for producing corrugated sheet-like elements, particularly for packaging, thermal insulation, soundproofing and the like, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a schematic elevation view of the automatic machine;
Figure 2 is a schematic plan view of the automatic machine;
Figure 3 is an elevation view of a detail of the means for continuously corrugating the first ribbon;
Figure 4 is a plan view of the end part of the means for continuously corrugating the first ribbon;
Figure 5 is a perspective view of the end part of the means for continuously corrugating a ribbon;
Figure 6 is a schematic view of another embodiment of the machine, with the application of a flat ribbon on both sides;
Figure 7 is an elevation view of different means for actuating the lower bars;
Figure 8 is a schematic bottom view of the means for actuating the lower bars upon insertion of the bars between the ribbons;
Figures 9 and 10 are views of two different possible couplings between the upper conveyor and the lower conveyor for providing a different type of corrugation;
Figures 11 to 19 are views of further possible embodiments of a variously corrugated sheet-like element.

Ways of carrying out the Invention

[0013] With reference to the figures, the automatic machine for producing corrugated sheet-like elements, particularly for packaging, thermal insulation, soundproofing and the like, comprises a supporting framework, generally designated by the reference numeral 1, which supports means, generally designated by the reference numeral 2, for continuously corrugating a first ribbon.

[0014] Said means for continuously corrugating a first ribbon are constituted by a reel 5 for dispensing the first ribbon 3, which is supported so that it can rotate on the supporting framework 1 and feeds a ribbon preferably made of expanded plastic material.

[0015] It is also possible to feed a first ribbon and at least one first adjacent ribbon, so as to have a longitudinal separation line on the ribbons 3 that will be corrugated.

[0016] The corrugating means 2 are constituted by an

upper conveyor, generally designated by the reference numeral 10, and by a lower conveyor 11.

[0017] The upper conveyor is constituted by an upper chain 12, which continuously winds around gears 13 that are arranged at the ends and are connected to motor means that determine the type of movement and the speed of the ribbon.

[0018] The upper conveyor 10 has a plurality of upper rods or bars 14, which are connected to lateral arms 15 that protrude from coupling blocks 16, which in practice are associated with the links of the chain 12, so as to always lie substantially at right angles to the orientation of the chain.

[0019] The upper rods 14 engage the upper face of the first ribbon 3 and move in a longitudinal direction in step with the lower conveyor 11, which has a lower chain 20 that winds around lower gears 21, which are motorized so as to produce synchronous motion between the lower chain 20 and the upper chain 12.

[0020] Means for actuating lower rods 24 are connected to the chain 20 and are constituted for example by a plurality of lower cylinders 23, which are arranged at right angles to the extension of the chain 20 and support a plurality of lower rods 24, which are moved along directions that are substantially parallel to the direction of the upper rods 14, so as to be intercalated between said rods.

[0021] In greater detail, the lower branch of the upper conveyor 10 in practice intersects the upper branch of the lower conveyor 11, so that the upper rods 14 and the lower rods 24 are mutually alternated and engage mutually opposite sides of the first ribbon 3, which accordingly assumes an undulated shape, for example a sinusoidal shape.

[0022] The lower rods 24 have a movement that is perpendicular to the direction of motion of the ribbon for the reasons that will become better apparent hereinafter and in order to be able to disengage from the first ribbon when required.

[0023] The machine further comprises an auxiliary chain 25, which moves synchronously with respect to the chain 20 and is arranged on the side of the upper conveyor that lies opposite the side where the cylinders 23 are provided.

[0024] The auxiliary chain supports a plurality of guiding elements 26, which are in step with the cylinders 23, in order to support the free end of the lower rods 24 in the extracted position.

[0025] The automatic machine further comprises means for feeding 29 a second flat ribbon in step with the first ribbon.

[0026] Said feeding means are constituted by a reel 29 for dispensing a second ribbon 30, which is supported by the framework 1 and feeds the ribbon 30 on a coupling roller 31 that is positioned below the upper rods, proximate to the upper branch of the first conveyor.

[0027] With this arrangement, the second ribbon 30 is arranged laterally adjacent to the lower face of the first ribbon 3, which has assumed an undulated configuration, so that a series of lower rods 24 remains inserted in the cavities formed between the first ribbon 3 and the second ribbon 30.

[0028] Furthermore the machine has joining means that provide the mutual coupling in discrete regions between the first ribbon 3 and the second ribbon 30.

[0029] Said joining means, in a preferred embodiment, are constituted by a hot air blower 40, which in practice produces a localized melting of the plastic material that constitutes the first and second ribbons, achieving coupling by contact at the roller 31 over which the second ribbon is passed upon contact with the lower bend of the first ribbon.

[0030] In this coupling step, the upper rods 14 in practice press the first ribbon onto the second ribbon, thus facilitating the coupling to the second ribbon, which is flat.

[0031] Proximate to the end of the upper branch of the lower conveyor 11, the lower rods must be extracted from the cavities and therefore disengage from the two coupled ribbons, which as shown in the drawings, assume a configuration that forms a plurality of cavities.

[0032] The rods 24 remain retracted within the corresponding cylinders 23 until they arrive proximate to the end of the lower branch of the lower conveyor, in which the rods are extracted from the cylinders and arrange themselves so that they can lie below the first ribbon and above the second ribbon.

[0033] With the arrangement described above, therefore, a machine can be obtained that is capable of continuously and automatically joining one another two ribbons of expanded plastic material, one of which is corrugated so as to obtain, between the first and second ribbons, a plurality of side-by-side cavities, which allow to reduce the weight of the resulting article and to provide in practice a plurality of chambers that form a valid barrier both for soundproofing and for thermal insulation.

[0034] According to what is shown in Figure 6, another embodiment of the machine is provided which, together with the same components described earlier for coupling the first and second ribbons, has a station 60 for coupling an additional flat ribbon 61, obviously on the opposite side with respect to the side provided with the second ribbon 30.

[0035] For this purpose, a second hot air blower 62 is provided, which produces a localized melting of the additional ribbon 61 in order to achieve coupling to the corrugated ribbon 3 at a coupling ribbon 63 that lies above the article being produced and is arranged along the extension of the upper conveyor 10.

[0036] Advantageously, over a certain extent, the rods 24 are left within the bends so as to facilitate dimensional stability during coupling and are then extracted in order to allow separation by extracting the rods at the upper end branch of the lower conveyor, which in this case is extended with respect to the upper conveyor.

[0037] Advantageously, as shown more clearly in Figures 7 to 8, different means are provided for the actuation of the rods 24, such means being constituted by carriages

70 that can move in a direction that is substantially parallel to the advancement of the rods and are supported by two guiding bars 71, which move in step with the lower conveyor so as to allow the insertion and extraction of the rods in the intended manner.

[0038] In order to move the rods 24, above the carriages 70, which are provided with engagement pins 75, there are actuation conveyors 80, which are provided with flaps 81 that are uniformly spaced, move in the direction of motion of the rods 24, and engage in succession the pins 75 so as to provide, in the intended spaces, the translational motion of the rods 24, which are made to enter and exit the bends formed by the ribbon being corrugated.

[0039] The provided arrangement allows to achieve rapid movement with very simple means.

[0040] Advantageously, said actuation means or conveyors 80 are provided at the end portion of the upper branch of the lower conveyor, where extraction is performed, and at the lower portion of the lower branch of the lower conveyor, where insertion is performed.

[0041] The machine also allows to vary at will the breadth of the bends of the ribbon being corrugated, and for this purpose distance variation means 90 are provided that allow to modify at will the mutual distance between the lower conveyor 11 and the upper conveyor 10.

[0042] As shown in Figures 9 and 10, it is also possible to change at will the mutual spacing between the rods, so as to be able to vary, according to the manufacturing requirements, both the dimensions and the spacing of the bends provided on the corrugated ribbon 10.

[0043] It should be noted, and it is a very important aspect, that the machine described above allows to continuously provide a ribbon in which the corrugated layer is obtained by continuously undulating a flat sheet, with bends that lie substantially at right angles to the direction of extension of the ribbon; moreover, the bends are connected in discrete regions to at least one other flat sheet.

[0044] Furthermore, the possibility to couple a plurality of ribbons in successive steps allows to obtain a very wide range of products that are always differentiated.

[0045] From what has been described above, it is therefore evident that the invention achieves the intended aim and objects, and in particular the fact is stressed that the machine described above allows to provide automatically and continuously the coupling of two or more ribbons of expanded plastic material, thus obtaining a manufactured article that is particularly practical and valid from a functional and commercial standpoint.

[0046] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0047] Several possible embodiments of the corrugated sheet-like element are illustrated with reference to Figures 11 to 19; said element is produced by using an apparatus of the type described above, which can have additional processing stations or in which a sheet-like element that has already been processed is inserted instead of one of the ribbons.

[0048] Figure 11 illustrates a corrugated sheet-like element, designated by the reference numeral 50, in which an additional corrugated layer is inserted and is coupled to the flat ribbon, on one side of which a corrugated ribbon had already been provided.

[0049] Figure 12 is a view of a corrugated sheet-like element 51 in which, on the opposite sides of the flat ribbon, there are corrugated ribbons having different corrugation pitches.

[0050] In Figure 13, the sheet-like element 52 has corrugated elements connected to the sides of the flat ribbon; one of said corrugated elements has an alternating pitch, i.e., a bend is formed between spaces in which, instead of the bend, contact is provided between the flat ribbon and the corrugated ribbon and covers an extent that corresponds to a spacing pitch, i.e., a region in which a corrugation could be provided.

[0051] In Figure 14, the sheet-like element 53 is provided by means of two flat ribbons, between which a corrugated ribbon is arranged.

[0052] Figure 15 is a view of a sheet-like element 54 in which there is an alternation of corrugated ribbons and flat ribbons; the sheet-like element 55 of Figure 16 also has an alternation of corrugated ribbons and flat ribbons, with corrugated ribbons that have different spacing pitches and widths.

[0053] In Figure 17, the sheet-like element 56 is provided by coupling to the flat ribbon a corrugated ribbon with alternating pitch; Figure 18 instead illustrates a sheet-like element 57 in which a corrugated ribbon with alternating pitch is provided between two flat ribbons.

[0054] Figure 19 is a view of the sheet-like element 58, in which there are flat ribbons between which different types of corrugated ribbon, such as for example a corrugated ribbon with uniform pitch and a corrugated ribbon with alternating pitch, are alternated.

[0055] The articles described above can be produced by providing additional stations on the machine described above, or it is possible to use the same type of machine, in which a manufactured article is fed which is constituted by the coupling of a plurality of previously provided ribbons, so as to obtain the chosen combination.

[0056] All the details may further be replaced with other technically equivalent elements, and individual characteristics given in relation to specific examples may actually be interchanged with other different characteristics that exist in other examples of embodiments.

[0057] In practice, the materials used, so long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to requirements.

Claims

1. An automatic machine for producing corrugated sheet-like elements, particularly for packaging, thermal insulation, soundproofing and the like, compris-

ing means (2) for continuously corrugating at least one first ribbon (3) that moves longitudinally, means for feeding (29) a second flat ribbon (30) in step with said first ribbon (3), and means for joining (40) one another said at least one first (3) and second (30) ribbons in discrete regions,said means (2) for continuously corrugating at least one first ribbon (3) comprise a reel (5) for dispensing said at least one first ribbon (3) to be inserted between an upper conveyor (10) and a lower conveyor (11), said upper conveyor (10) has a plurality of upper rods (14) that can be arranged so as to be intercalated between lower rods (24) supported by said lower conveyor (11), the upper rods (14) and the lower rods (24) being mutually alternated and mutually engaging opposite sides of the first ribbon (3) which accordingly assumes an undulated shape, **characterized in that** said lower rods (24) can move along directions that are substantially parallel to the direction of said upper rods (14) and are substantially perpendicular to the advancement direction of said conveyors (10, 11).

2. The automatic machine according to claim 1, **characterized in that** said means (29) for feeding a second flat ribbon (30) in step with the first ribbon (3) are laterally adjacent to the lower surface of the first ribbon (3), which has assumed an undulated configuration, so that a series of lower rods (24) remains inserted in cavities formed between the first ribbon (3) and the second ribbon (30).

3. The automatic machine according to the preceding claims, **characterized in that** said upper conveyor (10) has a plurality of said upper rods (14), which are supported by lateral arms (15) that protrude from coupling blocks (16) that are associated with the links of a continuous upper chain (12), said arms (15) being arranged substantially at right angles to the orientation of said chain (12).

4. The automatic machine according to one or more of the preceding claims, **characterized in that** said lower conveyor (11) has a lower chain (20) to which a plurality of said lower rods (24) connected to means (23) for the actuation of said lower rods (24) is connected.

5. The automatic machine according to one or more of the preceding claims, **characterized in that** a lower branch of said upper conveyor (10) intersects an upper branch of said lower conveyor (11) in order to arrange said upper rods (14) and said lower rods (24) so that they are mutually alternated.

6. The automatic machine according to one or more of the preceding claims, **characterized in that** it comprises an auxiliary chain (25) that can move in step with said lower chain (20) and supports a plurality of guiding elements (26) that can engage the end of said lower rods (24) in a position in which they are extracted from said actuation means comprising cylinders (23).

7. The automatic machine according to one or more of the preceding claims, **characterized in that** said means for feeding a second flat ribbon (30) in step with said first ribbon comprise a reel (29) for dispensing a second ribbon (30) that winds onto a coupling roller (31) that is arranged proximate to the upper branch of said lower conveyor (11) below said lower rods (24).

8. The automatic machine according to one or more of the preceding claims, **characterized in that** said means for joining one another said first ribbon and said second ribbon in discrete regions comprise a hot air blower (40), which acts between said first ribbon (3) and said second ribbon (30) before the coupling between said second ribbon (30) and the lower bends of said first ribbon (3).

9. The automatic machine according to one or more of the preceding claims, **characterized in that** said lower rods (24) accommodated in the cavities formed between said first ribbon (3) and said second ribbon (30) are extracted from said cavities proximate to the end of said upper branch of the lower conveyor (11).

10. The automatic machine according to one or more of claims 7-10, **characterized in that** said lower rods (24) are extracted from said cylinders (23) proximate to the end of the lower branch of said lower conveyor (11).

11. The automatic machine according to one or more of the preceding claims, **characterized in that** it comprises means for introducing an additional ribbon (61) with a longitudinal motion, means for the corrugation of said additional ribbon (61) being further provided.

12. The automatic machine according to one or more of the preceding claims, **characterized in that** it comprises means (64) for feeding an additional flat ribbon.

13. The automatic machine according to one or more of the preceding claims, **characterized in that** it feeds a corrugated sheet-like element (3, 30) produced earlier for coupling to an additional ribbon (61).

14. The automatic machine according to one or more of the preceding claims, **characterized in that** it comprises, at the end of said upper conveyor (10), a station (60) for the coupling of an additional flat ribbon (61) on the side that lies opposite the one provided

with said second ribbon (30).

15. The automatic machine according to one or more of the preceding claims, **characterized in that** it comprises a second hot air blower (62) that acts between said additional flat ribbon (61) and the corrugated sheet-like element (3, 30) that exits from said upper conveyor (10).

16. The machine according to one or more of the preceding claims, **characterized in that** it comprises said means (70, 80) for the actuation of said lower rods (24) at the end of the upper branch of said lower conveyor (11).

17. The automatic machine according to claim 16, **characterized in that** said rod actuation means (70, 80) comprise carriages (70) that can move along directions that are substantially parallel to the advancement of said rods (24), said carriages (70) being supported by two guiding bars (71) that can move in step with said lower conveyor (11) for the insertion and extraction of said rods (24) respectively at the end of the lower branch and at the end of the upper branch of said lower conveyor (11).

18. The automatic machine according to claim 17, **characterized in that** it comprises, above said carriages (70), pins (75) for engaging an actuation conveyor (80), which is provided with flaps (81) that are uniformly spaced and move in the direction of motion of said rods (24), said flaps (81) engaging in succession said pins (75), for the translational motion of said rods (24) in the direction for insertion and extraction with respect to the corrugated ribbon being formed.

19. The automatic machine according to one or more of the preceding claims, **characterized in that** it comprises means (90) for mutually varying the distance between said lower conveyor (11) and said upper conveyor (10) in order to change the breadth of the bends being provided on said at least one first longitudinally moving ribbon.

20. A method for providing corrugated sheet-like elements using the machine of claim 1 whereby it provides, on a ribbon (3) that advances continuously, corrugations along a direction that is substantially perpendicular to the advancement direction and whereby it stably connects the ribbon (3) thus corrugated to a flat ribbon (30) that advances continuously.

21. The method according to one or more of the preceding claims, **characterized in that** the coupling between said corrugated ribbon (3) and said flat ribbon (30) is provided at the ends of the bends of said corrugated ribbon (3).

22. The method according to one or more of the preceding claims, **characterized in that** it provides for corrugating at least two ribbons arranged side by side and separated along a line that is substantially parallel to the advancement line of said ribbon, the corrugated and mutually separated ribbons being connected to a single flat ribbon.

23. The method according to one or more of the preceding claims, **characterized in that** the coupling between the respective ribbons is provided by localized melting.

24. The method according to one or more of the preceding claims, **characterized in that** said ribbons (3, 30) are made of expanded material.

Patentansprüche

1. Eine automatische Vorrichtung zur Herstellung gewellter Folien-ähnlicher Elemente, insbesondere zur Verpackung, Wärmedämmung, Schalldämpfung und dergleichen, die Folgendes umfasst : Mittel (2) zum kontinuierlichen Wellen mindestens eines ersten Bandes (3), das sich in Längsrichtung bewegt, Mittel zum Einführen (29) eines zweiten flachen Bandes (30) gleichlaufend mit dem ersten Band (3) und Mittel zur Verbindung (40) des mindestens einen ersten (3) und zweiten (30) Bandes miteinander in diskreten Bereichen, wobei die Mittel (2) zum kontinuierlichen Wellen mindestens eines ersten Bandes (3) eine Spule (5) zur Abgabe des mindestens einen ersten Bandes (3) umfassen, das zwischen einem oberen Förderer (10) und einem unteren Förderer (11) einzuführen ist; wobei der obere Förderer (10) eine Vielzahl von oberen Stäben (14) hat, die so angeordnet werden können, um zwischen unteren Stäben (24) eingeschoben zu sein, die von dem unteren Förderer (11) getragen werden, wobei die oberen Stäbe (14) und die unteren Stäbe (24) wechselseitig abwechselnd sind und wechselseitig in gegenüberliegenden Seiten des ersten Bandes (3) eingreifen, das dementsprechend eine Wellenform annimmt, **dadurch gekennzeichnet, dass** die unteren Stäbe (24) sich entlang Richtungen bewegen können, die im Wesentlichen parallel zu der Richtung der oberen Stäbe (14) sind und im Wesentlichen rechtwinklig zu der Transportrichtung der Förderer (10, 11) sind.

2. Die automatische Vorrichtung gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Mittel (29) zum Einführen eines zweiten flachen Bands (30) gleichlaufend mit dem ersten Band (3) seitlich an die untere Oberfläche des ersten Bands (3) angrenzen, das eine wellenförmige Anordnung angenommen hat, so

dass eine Reihe unterer Stäbe (24) in Hohlräume eingesetzt bleibt, die zwischen dem ersten Band (3) und dem zweiten Band (30) geformt sind.

3. Die automatische Vorrichtung gemäß den obigen Ansprüchen, **dadurch gekennzeichnet, dass** der obere Förderer (10) eine Vielzahl von oberen Stäben (14) hat, die von seitlichen Armen (15) getragen werden, welche von Kopplungsblöcken (16) ragen, die mit den Gliedern einer durchgehenden oberen Kette (12) verknüpft sind, wobei die Arme (15) im Wesentlichen in rechten Winkeln zu der Ausrichtung der Kette (12) angeordnet sind.

4. Die automatische Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** der untere Förderer (11) eine untere Kette (20) hat, mit der eine Vielzahl der unteren Stäbe (24), verbunden mit Mitteln (23) zur Betätigung der unteren Stäbe (24), verbunden ist.

5. Die automatische Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** ein unterer Zweig des oberen Förderers (10) einen oberen Zweig des unteren Förderers (11) schneidet, um die oberen Stäbe (14) und die unteren Stäbe (24) so anzuordnen, dass sie wechselseitig abwechselnd sind.

6. Die automatische Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie weiter eine zusätzliche Kette (25) umfasst, die sich gleichlaufend mit der unteren Kette (20) bewegen kann und eine Vielzahl von Führungselementen (26) trägt, die in das Ende der unteren Stäbe (24) in einer Position eingreifen können, in der sie aus den Betätigungsmittel umfassenden Zylindern (23) herausgezogen werden.

7. Die automatische Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die Mittel zur Zuführung eines zweiten flachen Bands (30) gleichlaufend mit dem ersten Band eine Spule (29) zum Transport eines zweiten Bands (30) umfassen, das um eine Kopplungsrolle (31) gewunden ist, die nahe dem oberen Zweig des unteren Förderers (11), unterhalb der unteren Stäbe (24), angeordnet ist.

8. Die automatische Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die Mittel zum Verbinden des ersten Bands und des zweiten Bands in diskreten Bereichen miteinander ein Heißluftgebläse (40) umfassen, das vor der Kopplung zwischen dem zweiten Band (30) und den unteren Biegungen des ersten Bands (3) zwischen dem ersten Band (3) und dem zweiten Band (30) wirkt.

9. Die automatische Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die unteren Stäbe (24), eingebracht in die Hohlräume, die zwischen dem ersten Band (3) und dem zweiten Band (30) geformt sind, nahe dem Ende des oberen Zweigs des unteren Förderers (11) aus den Hohlräumen herausgezogen werden.

10. Die automatische Vorrichtung gemäß einem oder mehreren der Ansprüche 7-10, **dadurch gekennzeichnet, dass** die unteren Stäbe (24) aus den Zylindern (23) nahe dem Ende des unteren Zweigs des unteren Förderers (11) herausgezogen werden.

11. Die automatische Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie Mittel zum Einführen eines zusätzlichen Bands (61) mit einer Längsbewegung umfasst, wobei weiter Mittel zum Wellen des zusätzlichen Bands (61) bereitgestellt werden.

12. Die automatische Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie Mittel (64) zum Einführen eines zusätzlichen flachen Bands umfasst.

13. Die automatische Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie ein gewelltes Folien-ähnliches Element (3, 30) einführt, das zuvor produziert wurde, zur Kopplung mit einem zusätzlichen Band (61).

14. Die automatische Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie am Ende des oberen Förderers (10) eine Station (60) zur Kopplung eines zusätzlichen flachen Bands (61) auf der Seite, die gegenüber derjenigen liegt, die mit dem zweiten Band (30) ausgestattet ist, umfasst.

15. Die automatische Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie ein zweites Heißluftgebläse (62) umfasst, das zwischen dem zusätzlichen flachen Band (61) und dem gewellten Folien-ähnlichen Element (3, 30) wirkt, das aus dem oberen Förderer (10) austritt.

16. Die Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie Mittel (70, 80) zur Betätigung der unteren Stäbe (24) am Ende des oberen Zweigs des unteren Förderers (11) umfasst.

17. Die automatische Vorrichtung gemäß Anspruch 16, **dadurch gekennzeichnet, dass** die Stab-Betätigungsmittel (70, 80) Schlitten (70) umfassen, die sich entlang Richtungen bewegen können, welche

im Wesentlichen parallel zur Vorwärtsbewegung der Stäbe (24) sind, wobei die Schlitten (70) von zwei Führungsschienen (71) getragen werden, die sich zum Einführen und Herausziehen der Stäbe (24) am Ende des unteren Zweigs beziehungsweise am Ende des oberen Zweigs des unteren Förderers (11) gleichlaufend mit dem unteren Förderer (11) bewegen können.

18. Die automatische Vorrichtung gemäß Anspruch 17, **dadurch gekennzeichnet, dass** sie oberhalb der Schlitten (70) Stifte (75) zum Eingreifen in einen Betätigungsförderer (80) umfasst, der mit Klappen (81) versehen ist, welche gleichmäßig beabstandet sind und sich in die Bewegungsrichtung der Stäbe (24) bewegen, wobei die Klappen (81) zur Translationsbewegung der Stäbe (24) in der Richtung zum Einführen und Herausziehen im Verhältnis zu dem gewellten Band, das geformt wird, nacheinander in die Stifte (75) eingreifen.

19. Die automatische Vorrichtung gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie Mittel (90) zum wechselseitigen Variieren des Abstands zwischen dem unteren Förderer (11) und dem oberen Förderer (10) zur Veränderung der Breite der Biegungen umfasst, die an dem mindestens einen ersten sich in Längsrichtung bewegenden Band bereitgestellt werden.

20. Ein Verfahren zur Bereitstellung gewellter Folienähnlicher Elemente unter Verwendung der Vorrichtung gemäß Anspruch 1, wodurch es auf einem Band (3), das sich kontinuierlich vorwärts bewegt, Wellungen entlang einer Richtung bereitstellt, die im Wesentlichen rechtwinklig zur Transportrichtung ist, und wodurch so gewellte Band (3) stabil mit einem flachen Band (30) verbindet, das sich kontinuierlich vorwärts bewegt.

21. Das Verfahren gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die Kopplung zwischen dem gewellten Band (3) und dem flachen Band (30) an den Enden der Biegungen des gewellten Bands (3) hergestellt wird.

22. Das Verfahren gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** es die Wellung mindestens zweier Bänder ermöglicht, die nebeneinander angeordnet und entlang einer Linie getrennt sind, die im Wesentlichen parallel zur Transport-Linie des Bands ist, wobei die gewellten und voneinander getrennten Bänder mit einem einzigen flachen Band verbunden werden.

23. Das Verfahren gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die Kopplung zwischen den jeweiligen Bändern durch örtliches Schmelzen ermöglicht wird.

24. Das Verfahren gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die Bänder (3, 30) aus expandiertem Material bestehen.

Revendications

1. Machine automatique pour produire des éléments de type feuille ondulée, en particulier pour l'emballage, l'isolation thermique et l'insonorisation et analogue, comprenant des moyens (2) pour l'ondulation continue d'au moins un premier ruban (3) qui se déplace longitudinalement, des moyens pour la distribution (29) d'un deuxième ruban plat (30) au pas avec ledit premier ruban (3), et des moyens pour joindre (40) l'un à l'autre lesdits au moins un premier (3) et un deuxième (30) ruban dans des régions discrètes, lesdits moyens (2) pour l'ondulation continue d'au moins un premier ruban (3) comprennent une bobine (5) pour distribuer ledit au moins un premier ruban (3) à insérer entre un convoyeur supérieur (10) et un convoyeur inférieur (11), ledit convoyeur supérieur (10) présente une pluralité de tiges supérieures (14) qui peuvent être agencées de sorte à être intercalées entre des tiges inférieures (24) supportées par ledit convoyeur inférieur (11), les tiges supérieures (14) et les tiges inférieures (24) étant mutuellement alternées et venant mutuellement en prise avec des côtés opposés du premier ruban (3) qui par conséquent prend une forme ondulée, **caractérisée en ce que** lesdites tiges inférieures (24) peuvent se déplacer le long de directions qui sont sensiblement parallèles à la direction desdites tiges supérieures (14) et sont sensiblement perpendiculaires à la direction d'avancement desdits convoyeurs (10, 11).

2. Machine automatique selon la revendication 1, **caractérisée en ce que** lesdits moyens (29) pour distribuer un deuxième ruban plat (30) au pas avec le premier ruban (3) sont latéralement adjacents à la surface inférieure du premier ruban (3) qui a pris une forme ondulée, de sorte qu'une série de tiges inférieures (24) restent insérées dans des cavités formées entre le premier ruban (3) et le deuxième ruban (30).

3. Machine automatique selon les revendications précédentes, **caractérisée en ce que** ledit convoyeur supérieur (10) présente une pluralité de tiges supérieures (14) qui sont supportées par des bras latéraux (15) qui font saillie depuis des blocs de couplage (16) qui sont associés aux mailles d'une chaîne supérieure continue (12), lesdits bras (15) étant agencés sensiblement à angle droit par rapport à l'orien-

tation de ladite chaîne (12).

4. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce que** ledit convoyeur inférieur (11) présente une chaîne inférieure (20) à laquelle est reliée une pluralité desdites tiges inférieures (24) reliées à des moyens (23) pour l'actionnement desdites tiges inférieures (24).

5. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**une branche inférieure dudit convoyeur supérieur (10) intersecte une branche supérieure dudit convoyeur inférieur (11) afin d'agencer lesdites tiges supérieures (14) et lesdites tiges inférieures (24) de sorte qu'elles sont mutuellement alternées.

6. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**elle comprend une chaîne auxiliaire (25) qui peut se déplacer au pas avec ladite chaîne inférieure (20) et supporte une pluralité d'éléments de guidage (26) qui peuvent venir en prise avec l'extrémité desdites tiges inférieures (24) dans une position dans laquelle elles sont extraites desdits moyens d'actionnement comprenant des cylindres (23).

7. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce que** lesdits moyens pour distribuer un deuxième ruban plat (30) au pas avec ledit premier ruban comprennent une bobine (29) pour distribuer un deuxième ruban (30) qui s'enroule autour d'un rouleau de couplage (31) qui est agencé à proximité de la branche supérieure dudit convoyeur inférieur (11) sous lesdites tiges inférieures (24).

8. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce que** lesdits moyens pour joindre l'un à l'autre ledit premier ruban et ledit deuxième ruban dans des régions discrètes comprennent un souffleur d'air chaud (40) qui agit entre ledit premier ruban (3) et ledit deuxième ruban (30) avant le couplage entre ledit deuxième ruban (30) et les anses inférieures dudit premier ruban (3).

9. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce que** lesdites tiges inférieures (24) logées dans les cavités formées entre ledit premier ruban (3) et ledit deuxième ruban (30) sont extraites desdites cavités à proximité de l'extrémité de ladite branche supérieure du convoyeur inférieur (11).

10. Machine automatique selon une ou plusieurs des revendications précédentes 7 à 10, **caractérisée en ce que** lesdites tiges inférieures (24) sont extraites desdits cylindres (23) à proximité de l'extrémité de la branche inférieure dudit convoyeur inférieur (11).

11. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**elle comprend des moyens pour introduire un ruban supplémentaire (61) avec un déplacement longitudinal, des moyens pour l'ondulation dudit ruban supplémentaire (61) étant en outre prévus.

12. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**elle comprend des moyens (64) pour distribuer un ruban plat supplémentaire.

13. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**elle distribue un élément de type feuille ondulée (3, 30) produit précédemment pour le couplage à un ruban supplémentaire (61).

14. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**elle comprend, au niveau de l'extrémité dudit convoyeur supérieur (10), une station (60) pour le couplage d'un ruban plat supplémentaire (61) sur le côté qui se trouve opposé à celui muni dudit deuxième ruban (30).

15. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**elle comprend un deuxième souffleur d'air chaud (62) qui agit entre ledit ruban plat supplémentaire (61) et l'élément de type feuille ondulée (3, 30) qui sort dudit convoyeur supérieur (10).

16. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**elle comprend lesdits moyens (70, 80) pour l'actionnement desdites tiges inférieures (24) au niveau de l'extrémité de la branche supérieure dudit convoyeur inférieur (11).

17. Machine automatique selon la revendication 16, **caractérisée en ce que** lesdits moyens d'actionnement des tiges (70, 80) comprennent des chariots (70) qui peuvent se déplacer le long de directions qui sont sensiblement parallèles à l'avancement desdites tiges (24), lesdits chariots (70) étant supportés par deux barres de guidages (71) qui peuvent se déplacer au pas avec ledit convoyeur inférieur (11) pour l'insertion et l'extraction desdites tiges (24) respectivement au niveau de l'extrémité de la branche inférieure et au niveau de l'extrémité de la branche supérieure dudit convoyeur inférieur (11).

18. Machine automatique selon la revendication 17, **ca-**

ractérisée en ce qu'elle comprend, au dessus desdits chariots (70), des broches (75) pour venir en prise avec un convoyeur d'actionnement (80) qui est muni de pattes (81) qui sont uniformément espacées et qui se déplacent dans la direction de déplacement desdites tiges (24), lesdites pattes (81) venant en prise en succession avec lesdites broches (75), pour le déplacement translationnel desdites tiges (24) dans la direction pour l'insertion et l'extraction par rapport au ruban ondulé en formation.

19. Machine automatique selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**elle comprend des moyens (90) pour varier mutuellement la distance entre ledit convoyeur inférieur (11) et ledit convoyeur supérieur (10) afin de changer la largeur des anses prévues sur ledit au moins un premier ruban en déplacement longitudinal.

20. Procédé pour fournir des éléments de type feuille ondulée utilisant la machine de la revendication 1 qui fournit sur un ruban (3) qui avance en continu, des ondulations le long d'une direction qui est sensiblement perpendiculaire à la direction d'avancement et qui relie de façon stable le ruban (3) ainsi ondulé à un ruban plat (30) qui avance continuellement.

21. Procédé selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** le couplage entre ledit ruban ondulé (3) et ledit ruban plat (30) est prévu aux extrémités des anses dudit ruban ondulé (3).

22. Procédé selon une ou plusieurs des revendications précédentes, **caractérisé en ce qu'**il prévoit l'ondulation d'au moins deux rubans agencés côte-à-côte et séparés le long d'une ligne qui est sensiblement parallèle à la ligne d'avancement dudit ruban, les rubans ondulés et mutuellement séparées étant reliés à un unique ruban plat.

23. Procédé selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** le couplage entre les rubans respectifs est prévu par fusion localisée.

24. Procédé selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** lesdits rubans (3, 30) sont en matériau expansé.

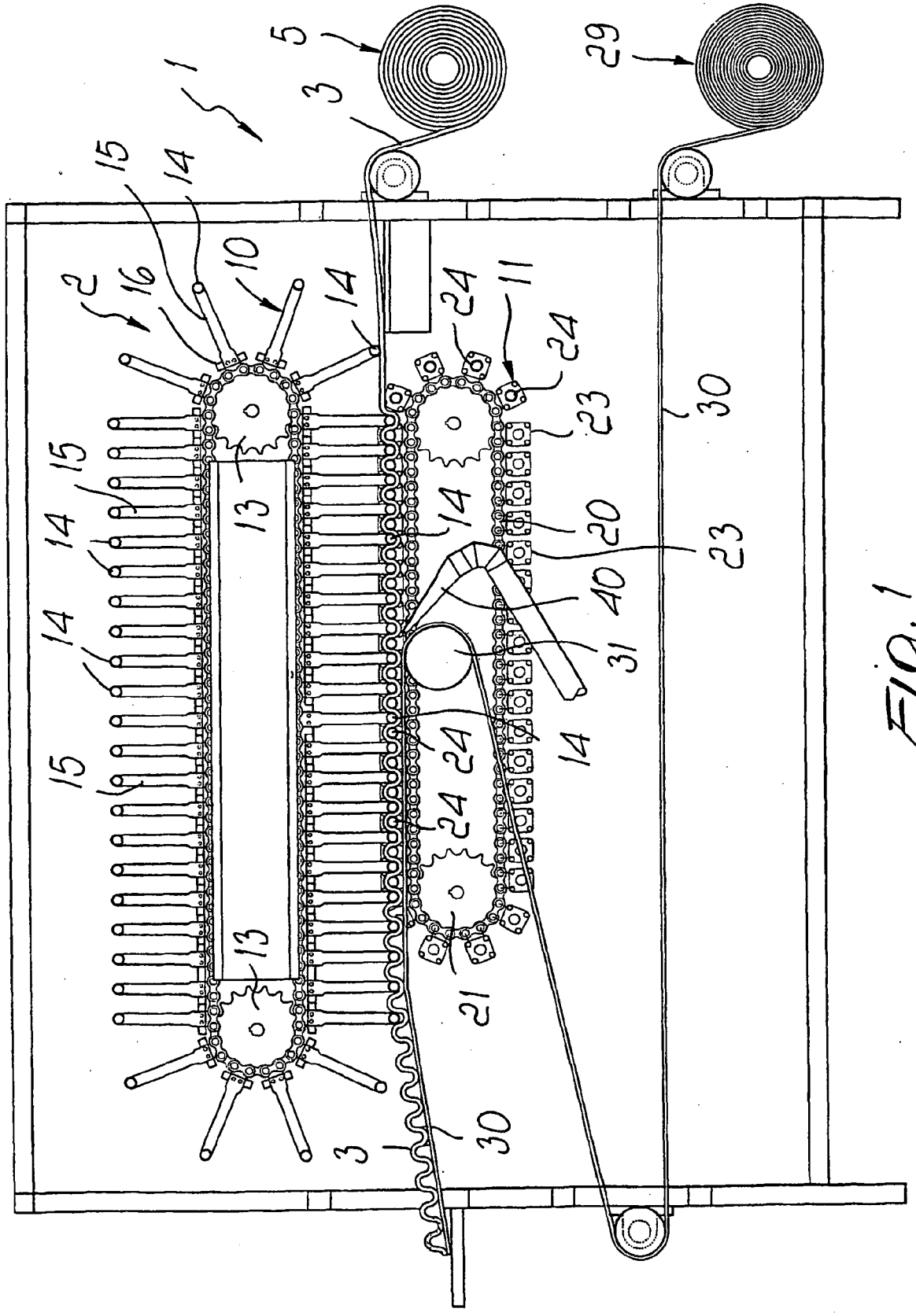
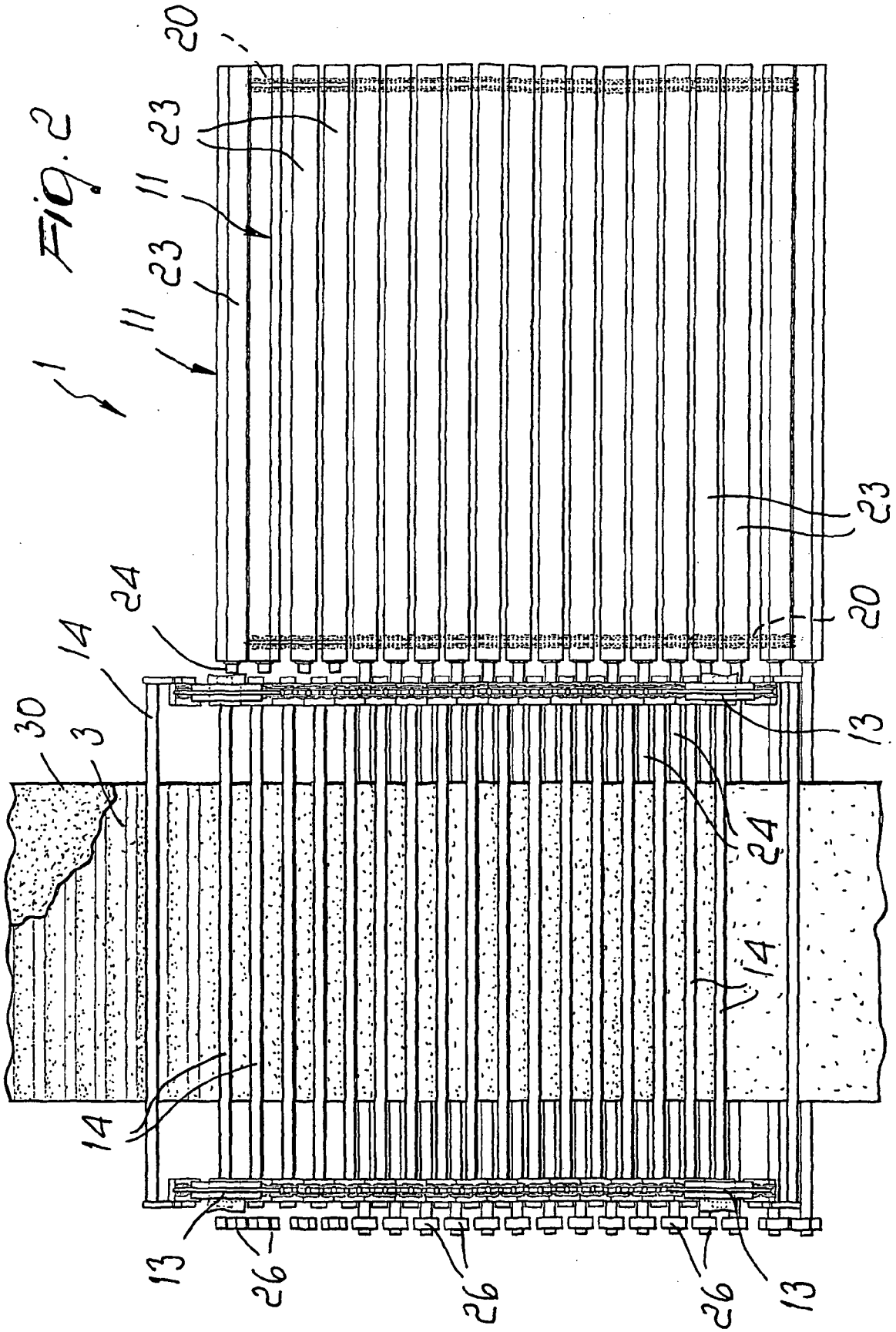


Fig. 1

Fig. 2



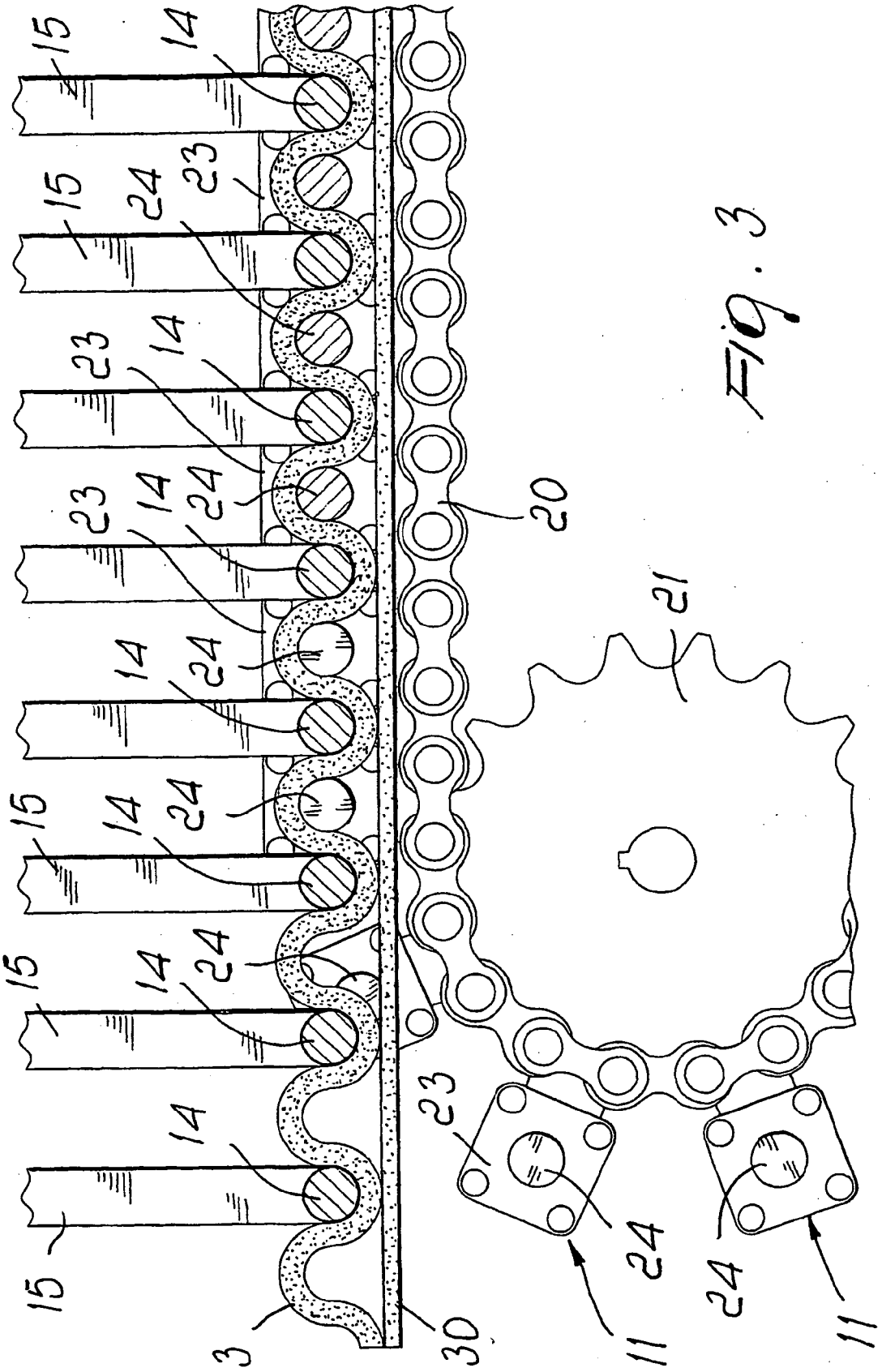

15
14
15
24
23
23
14
23
14
24
20
21
14
24
15
14
24
15
14
24
14
15
3
30
23
24
11
24
11

Fig. 3

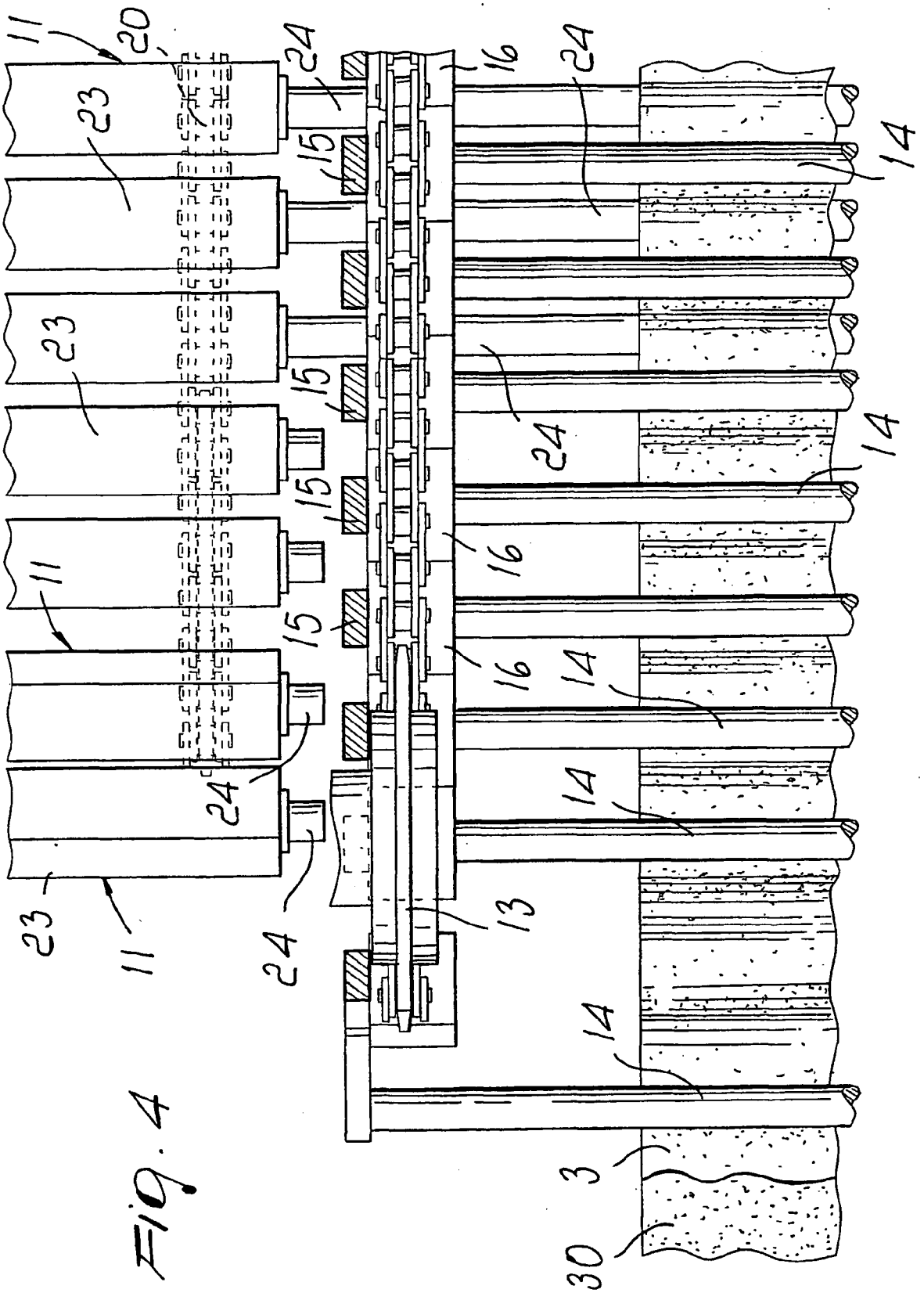

11
20
24
16
24
23
15
14
23
15
24
14
15
16
11
15
16
14
24
14
23
11
24
13
14
3
30

Fig. 4

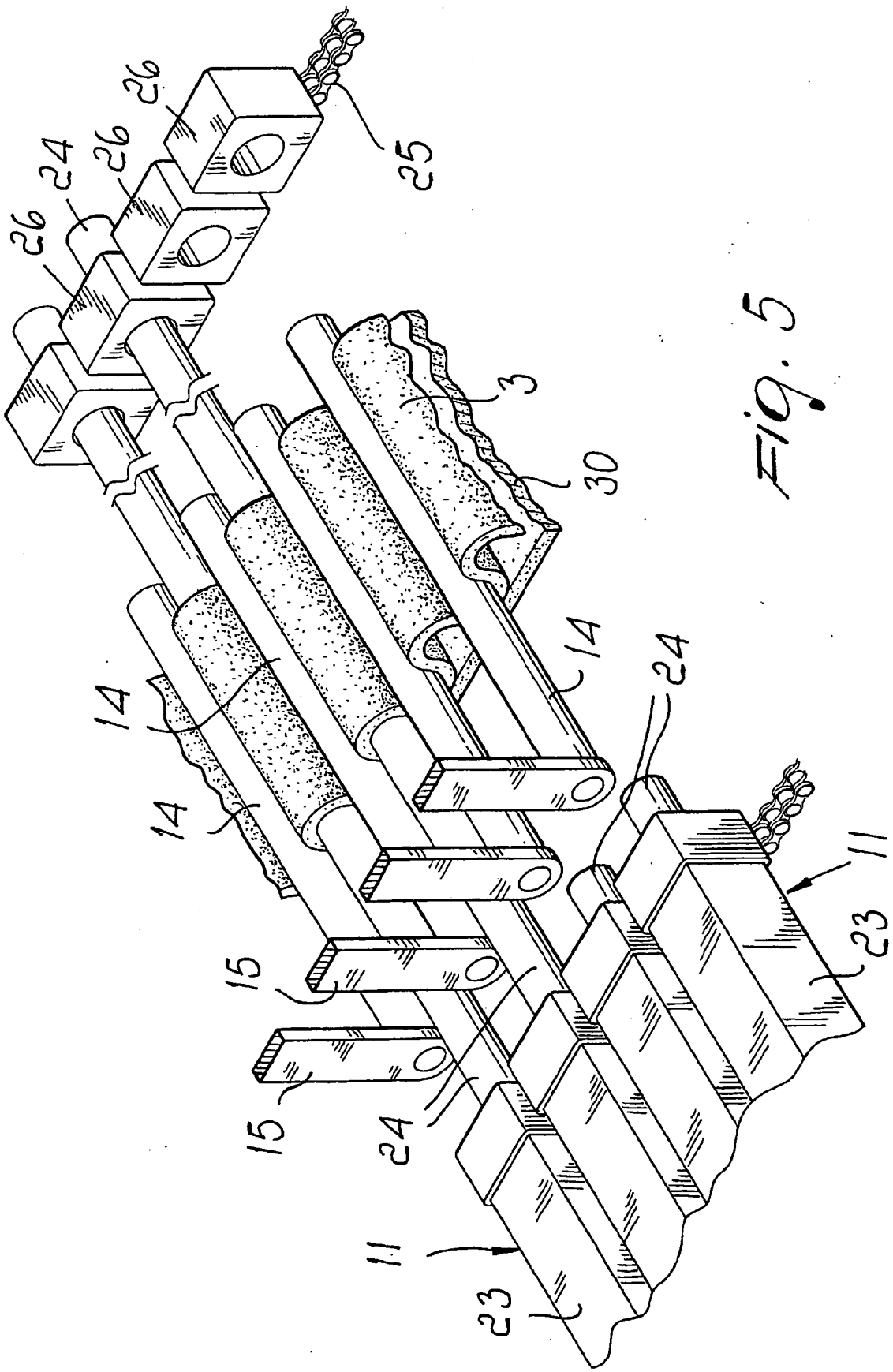


Fig. 5

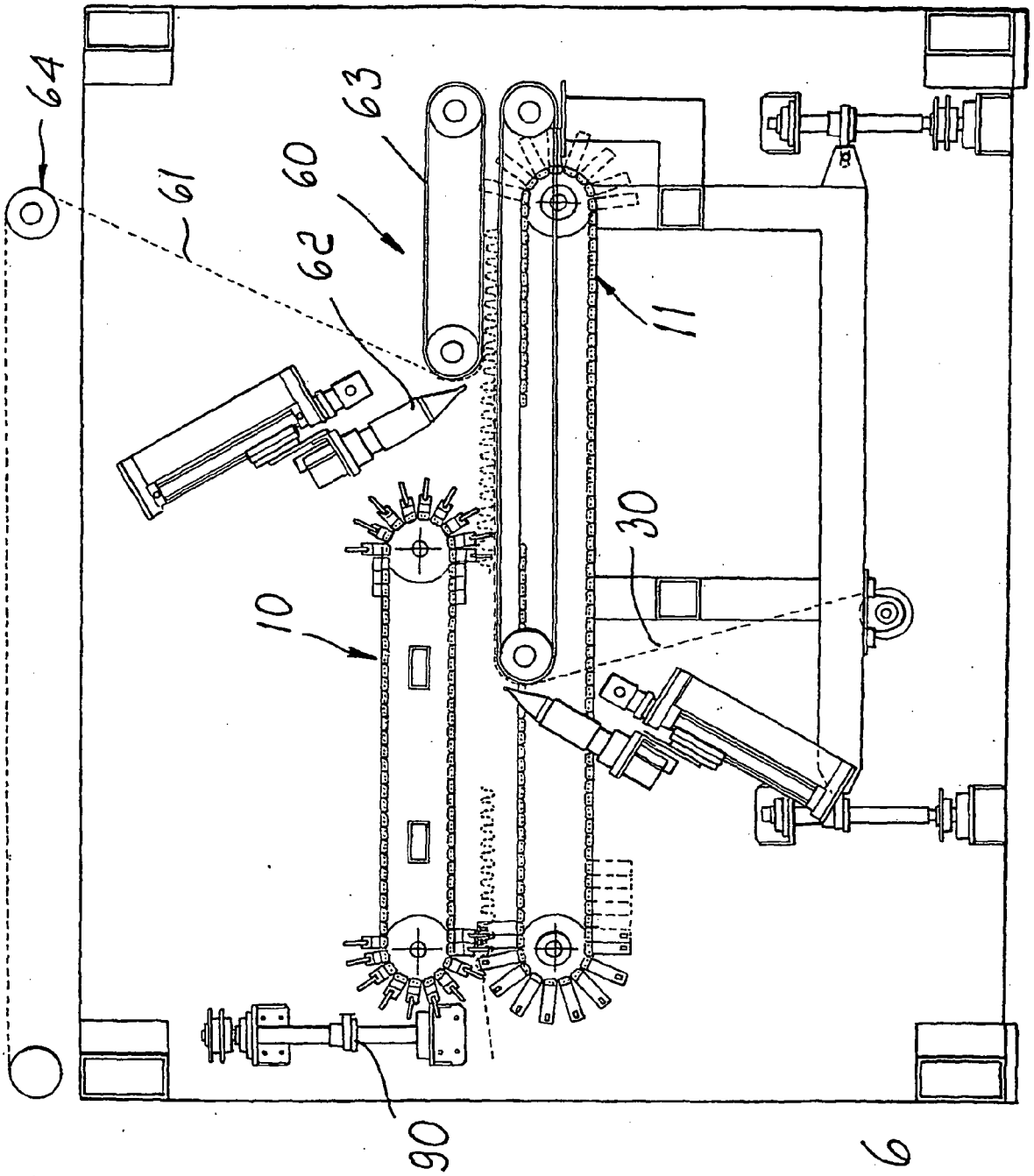


Fig. 6

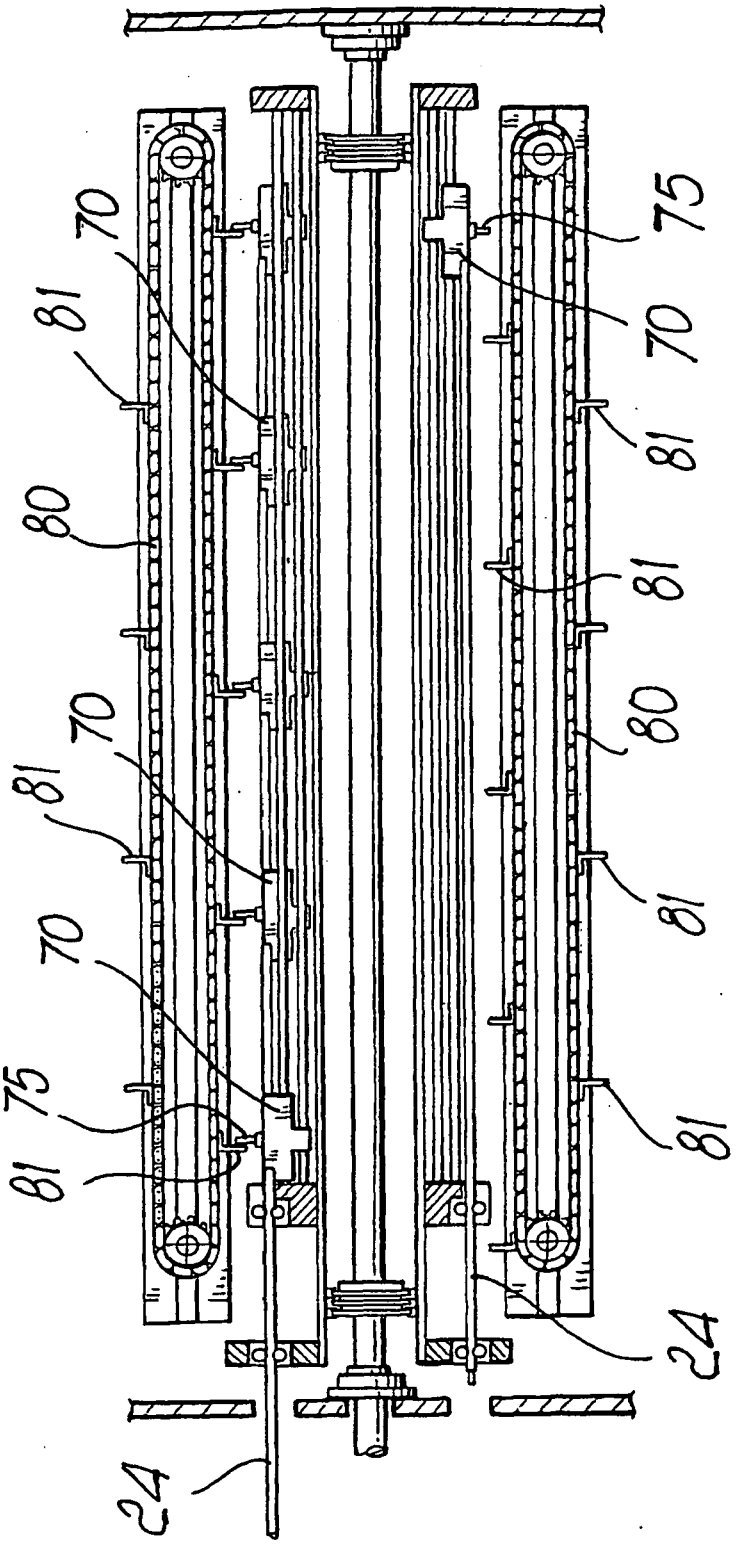


Fig. 7

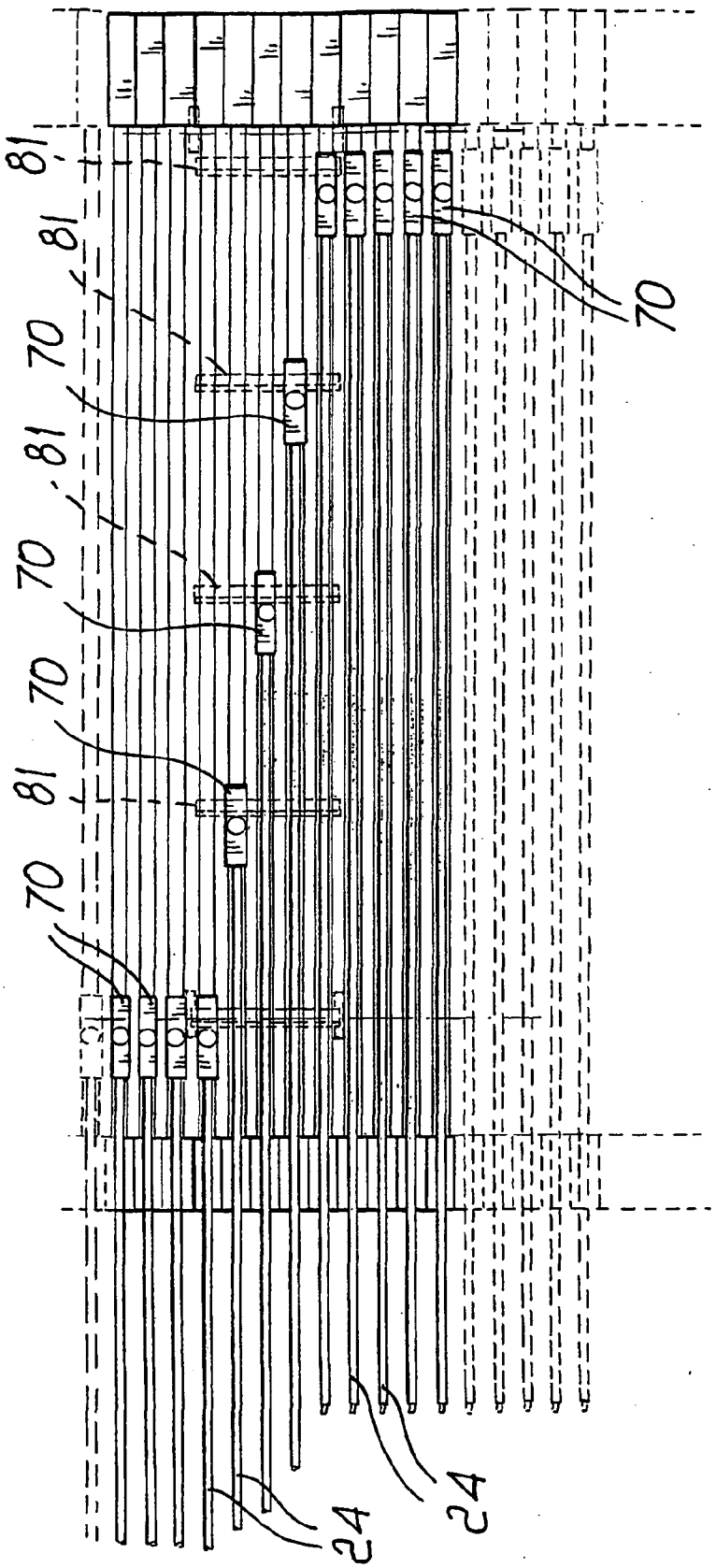


Fig. 8

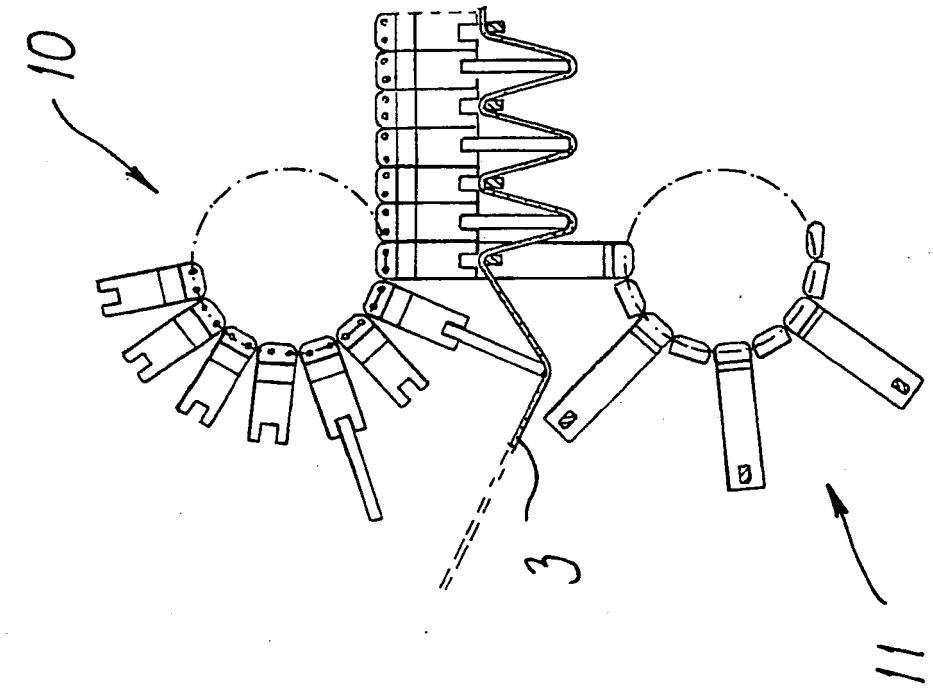


Fig. 10

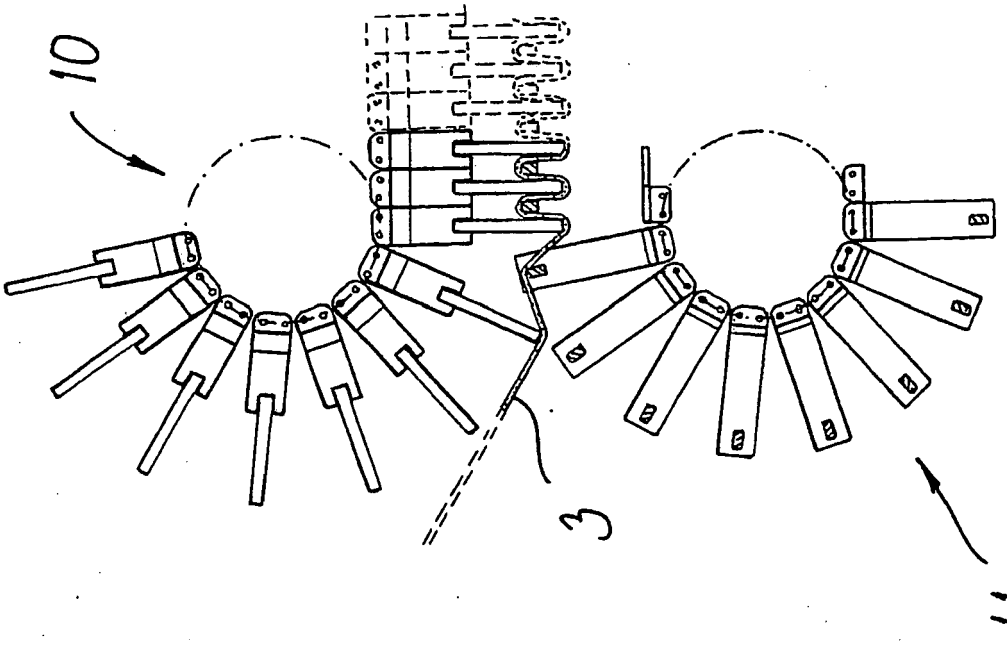


Fig. 9

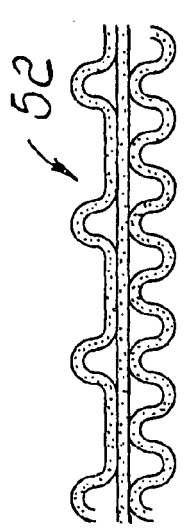


Fig. 13

Fig. 16

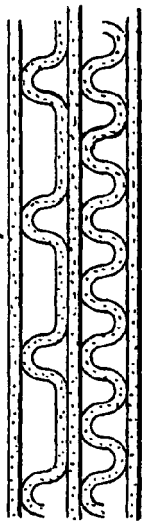


Fig. 19

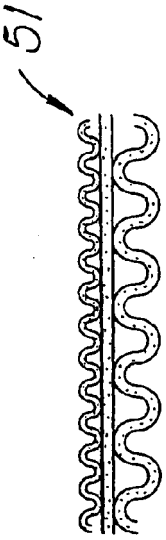


Fig. 12

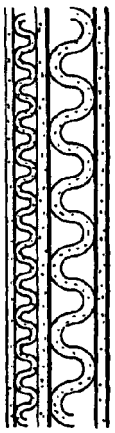


Fig. 15

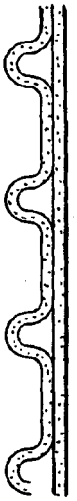


Fig. 18

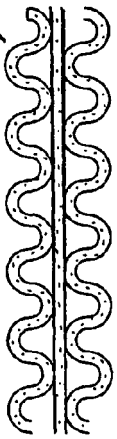


Fig. 11

Fig. 14

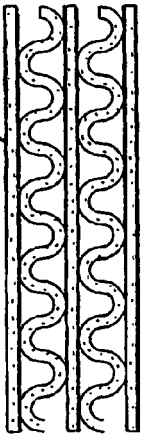


Fig. 17

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- GB 1110287 A **[0002]**
- FR 1373515 A **[0006]**