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(54) **METHOD AND APPARATUS FOR MANUFACTURING AN ELONGATED PRODUCT WITH A LONGITUDINAL AND STRENGHTENING REINFORCEMENT, AND SUCH A PRODUCT**

VERFAHREN UND VORRICHTUNG ZUR HERSTELLUNG EINES LÄNGLICHEN PRODUKTS MIT EINER LÄNGS- UND VERSTEIFUNGSBEWEHRUNG, SOWIE EIN DERART HERGESTELLTES PRODUKT

PROCEDE ET APPAREIL DE FABRICATION D'UN PRODUIT ALLONGE DOTE D'UN RENFORCEMENT LONGITUDINAL ET CONSOLIDATEUR, ET PRODUIT ALLONGE AINSI FABRIQUE

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Description

[0001] The invention relates to a method for manufacturing an elongated product from viscous, hardening material such as concrete or a similar material, provided with a longitudinal reinforcement and, at least locally, a helical strengthening reinforcement, wherein on a forming apparatus, over the length of the elongated product to be manufactured a longitudinal reinforcement is provided, while, on a desired place and over a desired length relative thereto, the strengthening reinforcement supplied from a supply location is positioned, and the viscous, hardening material is provided in the desired shape on and around the reinforcement from a feeder element which is held downstream at a distance in front of the supply location, while the provision of the viscous, hardening material is started near a first extremity of the longitudinal reinforcement and, subsequently, is continued in the direction of a second extremity of the longitudinal reinforcement located opposite the first extremity. The invention also relates to an apparatus for manufacturing such a product as well as the product itself.

[0002] A method of the type described hereinabove is known from GB-A 1 454 050 (US-A-3909431). Here, the strengthening reinforcement is formed on the outer shell of a pile which extends from the supply location for the strengthening reinforcement as far as into the feeder member for the viscous, hardening material and through which pile the-longitudinal reinforcement extends. The moment that, by means of the deforming element, the desired length of strengthening reinforcement has been formed around the pile, this length is cut off and can then be manually slid over the pile until the forward end of this length has been embedded in the supplied viscous hardening material such that when the feeder member is moved this length is not carried along, but remains stationary in the further supplied material. Manually moving a cut-off length of strengthening reinforcement when the forming apparatus is in operation is a hazardous action and can, moreover, adversely affect the accuracy of the positioning of the strengthening reinforcement relative to the longitudinal reinforcement.

[0003] As, during forming, the intended length of strengthening reinforcement rotates around the pile, this length is limited to the distance from the deforming element to the supply location, because otherwise, forming the elongated product such as a driven pile from viscous, hardening material would be disturbed. If the strengthening reinforcement is to be provided over a length which is longer than the intended maximum length of manufacture, then, use is to be made of two lengths of strengthening reinforcement to be manufactured one after the other. Like the first length, the second length can, with all associated drawbacks, be moved by hand and be pushed into the mass of material. This operation is harder still in view of the fact that the rearward extremity of the first length of strengthening reinforcement is present there too. That is why it has been proposed in GB-A-1 454 050 to screw the forward extremity of the second length into the rearward extremity the first length, so that the second length is held in its place by the first length, already embedded. However, this means that over the length of overlap twice the amount of strengthening reinforcement is present, which means unnecessary costs of material. Also, overlap must be provided, more specifically so over a minimal length. Moreover, the first length retaining the second length can entail problems because here, in fact, resilient bodies are involved, to be considered as springs, while a change in length through pulling can result in a reduction of the diameter so that clamping onto the pile might occur. Further, local engagement can cause pulling out of alignment and hence, once more, clamping onto the pile and disturbance of the manufacturing process.

[0004] The invention contemplates eliminating the above-described problems when applying the helical strengthening reinforcement, and providing a method wherein the helical strengthening reinforcement can be positioned relative to the longitudinal reinforcement in a safe and accurate manner, and wherein, without overlaps, a strengthening reinforcement composed from parts can be provided over the desired total length in an efficient manner and with a high production capacity.

[0005] This is achieved according to the invention in a method of the type described in the opening paragraph, in that the helical strengthening reinforcement is formed and fixed directly on and around the longitudinal reinforcement. Due to this feature, the strengthening reinforcement can be positioned on and attached to the desired location relative to the longitudinal reinforcement under optimal conditions, i.e. substantially before it is in contact with the viscous, hardening material, whereupon, with the feeder member moving, the thus composed longitudinal and strengthening reinforcement is enveloped by viscous, hardening material. Thus, in effect rapidly and effectively, an optimal configuration of the reinforcement can be obtained without manual intervention, by feeding at the proper rate and cutting off the strengthening reinforcement formed in situ at the right moment, which advantage is all the more clear considering the fact that elongated products such as the present are often manufactured in series, lying one behind the other on an extended forming apparatus with, for instance, a length of 100 meters or more.

[0006] Attaching the strengthening reinforcement onto the longitudinal reinforcement can be done by means of a clamping action, for instance by designing the helical strengthening reinforcement with an inner circumference which is smaller than the outer circumference of the longitudinal reinforcement. This could be considered to be less desirable because of the shifting of a length of strengthening reinforcement over and along the longitudinal reinforcement while it is being formed. Therefore, according to a further embodiment of the invention, it is proposed that the helical strengthening reinforcement be designed having at least one winding part with a smaller

diameter than a winding part preceding it or following it, while particularly, an embodiment is preferred wherein only a winding part which has been supplied last is a winding part with a smaller diameter. During manufacture, the strengthening reinforcement can smoothly shift over and along the longitudinal reinforcement, while after cutting, through resilient engagement, the last winding part fixes the strengthening reinforcement onto the longitudinal reinforcement at a position to be determined in advance.

[0007] In case clamping were considered to be insufficient, according to a further elaboration of the invention, it is proposed that the strengthening reinforcement is fixed at at least one location on the longitudinal reinforcement by a gluing, pressing, binding or heat treatment. It is then greatly preferred that the strengthening reinforcement is fixed to the longitudinal reinforcement with a binder element on at least one location.

[0008] Depending on the intended use of the elongated product, it can be desirable to provide the strengthening reinforcement at different locations to different degrees. Screwing lengths of strengthening reinforcement into each other locally can then be considered. However, according to a further embodiment of the invention, it is preferred that the helical strengthening reinforcement is fed with a pitch which, over a particular length of the longitudinal reinforcement, is adjusted to a desired amount of strengthening reinforcement over the particular length. In this manner, at any desired location, to any desired degree, a strengthening reinforcement can be provided in a simple and efficient manner, i.e., while using the material optimally and disturbing the forming process minimally.

[0009] In particular when manufacturing elongated products of great lengths, and certainly when manufacturing such products in series one after the other, the longitudinal reinforcement, also when it is biased, can droop. In those cases, according to a further elaboration of the invention, it is preferred that in an area upstream relative to the supply location, the longitudinal reinforcement be (re)positioned on positions which are mutually desirable and desirable relative to the forming apparatus.

[0010] The invention also relates to an apparatus for manufacturing an elongated product from viscous, hardening material such as concrete or a similar material, and provided with a longitudinal reinforcement and, at least locally, a strengthening reinforcement, which apparatus is provided with

- a lower forming part extending over the entire, in principle unlimited length of the elongated product to be manufactured and bearing means for positioning the longitudinal reinforcement;
- a deforming element for providing the strengthening reinforcement in a helical form;
- a feeder element for the viscous, hardening material, and
- forming means for bringing the viscous, hardening material in the desired shape on and around the reinforcement,

wherein the feeder element and the deforming element are arranged at a distance from each other and movably in the longitudinal direction of the lower forming part. Such an apparatus is known from the above-discussed GB-A 1 454050, wherein the strengthening reinforcement is manufactured on and around a pile with all associated problems already discussed. According to the invention, these can be eliminated by providing that the deforming element has an outlet which is placed upstream relative to the feeder element and which is in open communication with a space situated above the lower forming part, in which space, in a helically rotating manner, a predetermined length of strengthening reinforcement can be provided around the longitudinal reinforcement previously positioned in that space. Thus, in a simple manner, the possibility has been created for forming and fixing the strengthening reinforcement directly on and around the longitudinal reinforcement.

[0011] Fixing can be effected in an exceptionally reliable but also relatively simple manner when, according to a further embodiment of the invention, between the deforming element and the feeder element at least one binding means is arranged, with which a securing element can be provided for fixedly interconnecting the longitudinal and strengthening .reinforcement.

[0012] As already stated, fixing can also be realized by clamping the strengthening reinforcement on the longitudinal reinforcement locally or not locally by providing the helical strengthening reinforcement with an inside circumference which is smaller than the outer circumference of the longitudinal reinforcement. According to the invention, this can be realized in an efficient manner with relatively simple features when the deforming element is designed such that the helical strengthening reinforcement can be designed with a varying adjustable diameter. Thus, at any desired location and over any desired length, clamping between longitudinal reinforcement and strengthening reinforcement can be effected by adjusting the deforming element accordingly.

[0013] If, depending on the use of the elongated product, it is considered necessary that over at least one particular length at a particular position, more strengthening reinforcement is present than at other locations, this can be realized according to a further embodiment of the invention in a relatively simple but efficient manner, when the deforming element is designed such that the helical strengthening reinforcement can be designed with varying adjustable pitch. By reducing the pitch while forming the strengthening reinforcement, the amount of strengthening reinforcement per length-unit can be increased and vice versa.

[0014] The deforming element can then be designed such that the strengthening reinforcement introduced can have a continuously bent as well as a multiangular shape and be provided locally in a plane substantially

perpendicular to the longitudinal direction of the elongated product and have a helical configuration. It can further be advantageous that, viewed in upstream direction, in front of the feeder element, guiding means for positioning the strengthening reinforcement are arranged, which are detachable, so that positioning the strengthening reinforcement with respect to the longitudinal reinforcement can be effected even more accurately and reliably.

[0015] Especially with great lengths as mentioned, it can happen that at a distance from its points of attachment on the forming apparatus, the longitudinal reinforcement, also when this longitudinal reinforcement is biased, starts to droop. Due to the specific embodiment of the apparatus according to the invention, the space around and between the longitudinal reinforcement not yet enveloped by concrete is inaccessible only to fixed supporting means reaching between the longitudinal reinforcement over the distance to be kept small if desired, over which the strengthening reinforcement is provided, so that, according to the invention, it is further possible in an advantageous manner that upstream, at a small distance in front of the deforming element, guiding means for (re)positioning the longitudinal reinforcement are arranged which are detachable. Due to these features, by each time placing the reinforcement optimally, the product quality can be further improved.

[0016] The material for making the strengthening reinforcement can be stored in a relatively large supply, for instance wound on a roller, when at the deforming element a cutting device has been arranged with which a finalized desired length of strengthening reinforcement can be separated from the stock of material.

[0017] Finally, the invention also relates to an elongated product manufactured from a viscous, hardening material such as concrete or a similar material, and provided with a reinforcement composed from a longitudinal reinforcement consisting of a number of biased wires or rods, mutually regularly distributed in a circumferential area. Such an elongate product is disclosed in JP 57 173112, having a helically bent wire extending along its full length. According to the invention, locally a strengthening reinforcement consisting of at least one helically bent wire or rod proceeds around the longitudinal reinforcement which has been attached to the longitudinal reinforcement. The strengthening reinforcement can have a continuously bent or multiangular shape with a winding part which has a smaller free passageway than a winding part preceding it or following it, while it is further possible that the helical strengthening reinforcement has a smaller pitch over a particular length than a part preceding it or following it.

[0018] With reference to the exemplary embodiments represented in the drawings, the method and apparatus for manufacturing an elongated product and the product itself will be further elucidated, albeit exclusively as a matter of example. In the drawings:

Fig. 1 schematically shows, in side view, an apparatus for manufacturing a hollow, elongated product provided with a longitudinal reinforcement and a strengthening reinforcement;

Fig. 2 shows, in enlarged scale, the forming part of the apparatus according to Fig. 1;

Fig. 3 shows, in enlarged scale, the driving and deforming elements;

Fig. 4 shows, in side view, a part of Fig. 3; and

Fig. 5 shows a guiding construction for the reinforcements.

[0019] The apparatus represented in Fig. 1 is provided with a lower forming part 1 of a forming apparatus fixedly arranged on a supporting surface, and, moveably arranged relative to the forming part 1, a feeder element 2 in the shape of a funnel and a supporting bearing part 3, the funnel 2 and the supporting bearing part 3 being fixedly arranged relatively to each other. Via downwardly reaching parts (not shown), the supporting bearing part 3 bears an extruder assembly provided with a support tube 4, a transport element in the shape of a worm part 5 and a tube part 6, the arrangement being such that at least the worm part 5 is arranged for rotation about its central axis. On the supporting bearing part 3, a supply roller 7 is provided, on which roller a supply of material has been wound for manufacturing a strengthening reinforcement 8. Unwinding the thread-shaped material takes place by means of a driving device 9. The unwound material is brought into the desired shape with the aid of a deforming element 10 and cut to size by a cutting means 11. At its underside, the funnel 2 bears an upper forming part 12, roofing the tube part 6 at a distance, and being provided, at the lower outflow of the funnel, with an opening 13 for enabling a viscous, hardening material such as for instance concrete to be introduced into the forming part 12. Further, the lower forming part 1 is provided with means (not shown) for providing a biased longitudinal reinforcement 14, as shown in Fig. 2.

[0020] For manufacturing a hollow, elongated product with longitudinal reinforcement 14 and a local strengthening reinforcement 8 such as, for instance, a hollow, concrete driven pile, proceedings can be as follows.

[0021] First, on the lower forming part 1, a longitudinal reinforcement 14 is provided and biased in a configuration such that, during the following forming process, this longitudinal reinforcement extends around the extruder assembly 4, 5, 6 and through the space surrounded by the upper forming part 12 and the lower forming part 1. Thereupon, the mutually fixedly connected funnel 2 and supporting bearing part 3 are brought to the beginning of the fixed, lower forming part 1, whereupon extrusion of the elongated product can be started.

[0022] Should a strengthening reinforcement 8 be desired on the first extremity of the elongated product to be formed, then, via the driving device 9, thread-shaped material is withdrawn from the supply roller 7 by unwinding, which thread-shaped material is bent into a desired helical shape by the deforming element 10 such that the

thread-shaped material starts forming a strengthening reinforcement 8 extending helically on and along the _ longitudinal reinforcement 14. When reaching the worm part 5, the cutting means 11 is activated and the strengthening reinforcement 8 is severed from the thread-shaped material on the supply roller 7. If a strengthening reinforcement with a shorter length is desirable, this can be achieved by cutting sooner. If a strengthening reinforcement 8 with a longer length is desired, this can be realized, directly after cutting, by starting the formation of a new length of strengthening reinforcement which directly connects to the first length of strengthening reinforcement. For the purpose of keeping it in place, the strengthening reinforcement 8 can be fixed onto the longitudinal reinforcement 14. By selecting a suitable configuration of the strengthening reinforcement, this can be a clamping fixation. Instead thereof or in addition thereto, use can be made of binder elements coming from binding means 15 as shown in Fig. 2. The binding means 15 are movably arranged between the funnel 2 and the supporting bearing part 3. The binder elements can have any desired shape and design such as binding wires, springing clamps, clamping plates, staples and the like and be manufactured from any suitable material. Fixation can also be effected by performing a glue, press or heat treatment, in combination or not in combination with, once more, any one of the above-mentioned fixing methods.

[0023] Approximately at the moment the extremity of the strengthening reinforcement 8 approaches the opening 13, the supply of a viscous material such as concrete from the funnel 2 via the opening 13 as well as the displacement of the funnel 2, the supporting bearing part 3 and the upper forming part 12 over the lower forming part 1 in the direction of the other extremity of the longitudinal reinforcement 14 is started. The viscous material is pressed into the space between the upper forming part 12, the lower forming part 1 and the tube part 6 by the worm part 5, thereby embedding the longitudinal reinforcement 14 and the strengthening reinforcement 8, which are present in this annular space.

[0024] At any desired location in the longitudinal direction of the longitudinal reinforcement 14, a strengthening reinforcement 8 can be provided by forming a strengthening reinforcement 8 at that location in the above-described manner. This forming can be done without interrupting the movement of the funnel 2 over the lower forming part 1. This is so, because over the length of the deforming element 10 to the worm part 5, a strengthening reinforcement 8 can be formed without this disturbing the extrusion process. The rate at which a length of strengthening reinforcement 8 is formed can be adjusted to the rate of displacement of the funnel 2 over the lower forming part 1. When the forming rate equals the rate of displacement, then, viewed in longitudinal direction, the forward extremity of the strengthening reinforcement, rotating during forming, is stationary relative to the lower forming part 1. At the latest when the opening 13 of the funnel 2 reaches the forward end of the strengthening reinforcement 8, as shown in Fig. 2, the cutting means 11 is to enter into action. When a strengthening reinforcement 8 with a greater length is desired, immediately after cutting, the formation of a new length of strengthening reinforcement 8 can be started.

[0025] It is noted that instead of a roller of material, naturally, also measured lengths of material can be used. In that case, the omission of the cutting means 11 could be considered. However, this would reduce the flexibility of the apparatus and increase the complexity of the operations to be carried out; reason why the forming apparatus represented in the drawings is preferred.

[0026] The driving device 9 and the deforming element 10 are further represented in more detail in Figs. 3 and 4.

[0027] The driving device 9 is provided with driving elements engaging the thread-shaped material on both sides such as, for instance, wheels 16 represented in Fig. 3, which are driven by a pinion. As the drive, in a pushing manner, should not only ensure moving but also bending, the driving wheels 16 are kept in powerful contact with the thread-shaped material by a pushing member 18 and this material is guided between the driving device 9 and the deforming element 10 through a tube 19.

[0028] The deforming element 10 is provided with two bending wheels 20 as well as with a guide 21 for setting the pitch of the helical strengthening reinforcement 8 to be formed. The bending wheels can be adjusted relative to each other for adjusting the diameter of the helical strengthening reinforcement 8 to be formed. As a result, on the one side, the helical strengthening reinforcement 8 can be adapted to the elongated product to be manufactured, while, on the other side, a winding part of the strengthening reinforcement 8 can be of additionally bent design for the purpose of fixing the strengthening reinforcement 8 onto the longitudinal reinforcement 14. Movably arranging the guide 21 has this effect on the pitch and hence on the amount of strengthening reinforcement 8 per length-unit.

[0029] With the apparatus described hereinabove and represented in the drawing, for instance elongated, hollow driven piles can be manufactured, while it is further preferred to form several of those piles successively one behind the other. This means that the forming apparatus can have a length of, for instance, 100 meters or more. In order to prevent drooping of the longitudinal reinforcement 14, as shown in Fig. 5, guiding means 22 with recesses 24 have been provided, optionally reinforced with reinforcement guide 23 for supporting the wires of the longitudinal reinforcement 14. A guiding plate 25 can be present for holding the strengthening reinforcement 8 at the desired, centered location. The guiding means 22 with reinforcement guide 23 are positioned upstream relative to the deforming element 10. The guide plate 25 is placed between the deforming element 10 and the worm part 5 so as to be removable.

[0030] The various elements within the longitudinal reinforcement 14 and the strengthening reinforcement 8 such as the support tube 4, the worm part 5 and the tube

part 6 need to be supported. The longitudinal reinforcement 14 forms no problem because between the various wires, openings extending over the entire length are present, so that elements to be moved within the reinforcement in longitudinal direction of the elongated product to be formed as well as parts such as the guiding means 22 can be supported by supporting bearing part 3 without problems. This is not the case at the location of the strengthening reinforcement 8. However, as this extends over a relatively short length, at most the length of the support tube 4, the elements within and upstream of the strengthening reinforcement 8 such as the support tube 4, the worm part 5 and the tube part 6 can fairly simply and without problems be borne in an unsupported manner from a location situated upstream beyond the deforming member 10.

[0031] It is self-evident that within the framework of the invention as outlined in the accompanying claims, many modifications and variants are possible in addition to the modifications already mentioned hereinabove. For instance, in the foregoing, forming a hollow pile has been discussed. It will be clear that in this manner, also solid bodies in which a strengthening reinforcement is to be provided locally can be manufactured, while, instead of extrusion also a different method for compacting viscous, hardening material can be selected. By using a method suitable thereto, also the shape of the strengthening reinforcement can deviate from that of a pure helical shape.

Claims

1. A method for manufacturing an elongated product from viscous, hardening material such as concrete or a similar material, provided with a longitudinal reinforcement (14) and, at least locally, a helical strengthening reinforcement (8), wherein on a forming apparatus, over the length of the elongated product to be manufactured a longitudinal reinforcement (14) is provided, while, on a desired place and over a desired length relative thereto, the strengthening reinforcement supplied from a supply location is positioned, and the viscous, hardening material is provided in the desired shape on and around the reinforcement from a feeder element (2) which is held downstream at a distance in front of the supply location, while the provision of the viscous, hardening material is started near a first extremity of the longitudinal reinforcement (14) and, subsequently, is continued in the direction of a second extremity of the longitudinal reinforcement (14) located opposite the first extremity, **characterized in that** the helical strengthening reinforcement (8) is formed and fixed directly on and around the longitudinal reinforcement (14).

2. A method according to claim 1, **characterized in that** the helical strengthening reinforcement (8) is designed with at least one winding part having a smaller diameter than a winding part preceding or following it.

3. A method according to claim 2, **characterized in that** only a winding part supplied last is a winding part with a smaller diameter.

4. A method according to any one of the preceding claims, **characterized in that** the strengthening reinforcement (8) is attached on the longitudinal reinforcement (14) at at least one location with a binder element.

5. A method according to any one of the preceding claims, **characterized in that** the strengthening reinforcement (8) is fitted on the longitudinal reinforcement (14) at at least one location by a glue, pressure or heat treatment.

6. A method according to any one of the preceding claims, **characterized in that** the helical strengthening reinforcement (8) is fed with a pitch which, over a particular length of the longitudinal reinforcement (14), is adjusted to a desired amount of strengthening reinforcement (8) over the particular length,

7. A method according to any one of the preceding claims, **characterized in that** in an area upstream relative to the supply location the longitudinal reinforcement (14) is positioned or repositioned at positions which are mutually desirable and desirable relative to the forming apparatus.

8. An apparatus for manufacturing an elongated product from a viscous, hardening material such as concrete or a similar material, and provided with a longitudinal reinforcement (14), and, at least locally, a strengthening reinforcement (8), which apparatus is provided with

   - a lower forming part (1) extending over the, in principle, unlimited length of the elongated product to be manufactured and bearing means for positioning the longitudinal reinforcement;
   - a deforming element (10) for providing the strengthening reinforcement (8) in a helical form;
   - a feeder element (2) for the viscous, hardening material, and
   - forming means (1, 12) for bringing the viscous, hardening material in the desired shape on and around the reinforcement,

   wherein the feeder element (2) and the deforming element (10) are arranged at a distance from each other and movably in the longitudinal direction of the lower forming part (1), **characterized in that** the de-

forming element (10) has an outlet which is placed upstream relative to the feeder element (2) and which is in open communication with a space situated above the lower forming part (1), in which space, in a helically rotating manner, a predetermined length of strengthening reinforcement (8) can be provided around the longitudinal reinforcement (14) previously positioned **in that** space.

9. An apparatus according to claim 8, **characterized in that** between the deforming element (10) and the feeder element (2) at least one binder element is arranged.

10. An apparatus according to claim 8 or 9, **characterized in that** the deforming element (10) is designed such that the helical strengthening reinforcement (8) can be designed with varying adjustable diameter.

11. An apparatus according to any one of claims 8 - 10, **characterized in that** the deforming element (10) is designed such that the helical strengthening reinforcement (8) can be designed with a varying adjustable pitch.

12. An apparatus according to any one of claims 8 - 11, **characterized in that** viewed upstream, in front of the feeder element (2), guiding means (22) for positioning the strengthening reinforcement (8) are positioned, which are detachable.

13. An apparatus according to any one of claim 8 - 12, **characterized in that** upstream at a small distance from the deforming element (10), guiding means (22) for positioning or repositioning the longitudinal reinforcement (14) are positioned, which are detachable.

14. An apparatus according to any one of claims 8 - 13, **characterized in that** at the deforming element (10), a cutting means (11) is arranged.

15. An elongated product manufactured from a viscous, hardening material such as concrete or a similar material, and provided with a reinforcement composed of a longitudinal reinforcement (14) consisting of a number of biased wires or rods, mutually regularly distributed and arranged in a circumferential area, **characterized in that** locally, a strengthening reinforcement (8) is provided that consists of at least one helically bent wire or rod proceeding around the longitudinal reinforcement (14) and which has been fixed to the longitudinal reinforcement (14).

16. An elongated product according to claim 15, **characterized in that** the strengthening reinforcement (8) has a continuously or multi-angularly bent shape with a winding part having a smaller free passageway than a winding part preceding it or following it.

17. An elongated product according to claim 15 or 16, **characterized in that** over a particular length, the helical strengthening reinforcement (8) has a smaller pitch than a part preceding it or following it.

Patentansprüche

1. Verfahren zum Herstellen eines langgestreckten Produkts aus einem dickflüssigen abbindenden Werkstoff, wie zum Beispiel Beton oder einem ähnlichen Werkstoff, das mit einer sich längs erstrekkenden Armierung (14) und mindestens örtlich mit einer schraubengangförmigen verstärkenden Armierung (8) ausgestattet ist, wobei auf einer Formungsvorrichtung über die Länge des herzustellenden langgestreckten Produkts eine sich längs erstreckenden Armierung (14) vorgesehen ist, während an einer gewünschten Stelle und über eine gewünschte Länge relativ dazu die verstärkende Armierung, die von einem Lieferort zugeführt wird, angeordnet ist, und der dickflüssige abbindende Werkstoff in der gewünschten Form auf und um die Armierung von einem Zuführelement (2) geliefert wird, das stromabwärts in einer Entfernung vor dem Lieferort gehalten wird, während in der Nähe eines ersten Endes der sich längs erstrekkenden Armierung (14) das Zuführen des dickflüssigen abbindenden Werkstoffs gestartet und in der Folge in der Richtung eines zweiten Endes der sich längs erstreckenden Armierung (14) fortgesetzt wird, das dem ersten Ende entgegengesetzt ist,
dadurch gekennzeichnet,
dass die schraubengangförmige verstärkende Armierung (8) direkt auf der und um die sich längs erstreckende Armierung (14) ausgebildet und befestigt wird.

2. Verfahren nach Anspruch 1,
dadurch gekennzeichnet,
dass die schraubengangförmige verstärkende Armierung (8) mit mindestens einem Wicklungsteil konstruiert ist, der einen kleineren Durchmesser als ein Wicklungsteil hat, der diesem vorausgeht oder diesem folgt.

3. Verfahren nach Anspruch 2,
dadurch gekennzeichnet,
dass nur ein zuletzt gelieferter Wicklungsteil ein Wicklungsteil mit einem kleineren Durchmesser ist.

4. Verfahren nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet,
dass die verstärkende Armierung (8) an mindestens einem Ort mit einem Verbindungselement auf der sich längs erstreckenden Armierung (14) befestigt ist.

5. Verfahren nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet,
dass die verstärkende Armierung (8) an mindestens einem Ort auf der sich längs erstreckenden Armierung (14) mit einem Kleber, durch Druck oder Wärmebehandlung angebracht wird.

6. Verfahren nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet,
dass die schraubengangförmige verstärkende Armierung (8) mit einer Ganghöhe zugeführt wird, die über eine bestimmte Länge der sich längs erstrekkenden Armierung (14) auf einen gewünschten Wert der verstärkenden Armierung (8) über die bestimmte Länge eingestellt wird.

7. Verfahren nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet,
dass in einem Bereich, der stromaufwärts relativ zum Lieferort ist, die sich längs erstreckende Armierung (14) an Positionen angeordnet oder umgeordnet wird, die gegenseitig wünschenswert und relativ zur Formungsvorrichtung wünschenswert sind.

8. Vorrichtung zum Herstellen eines langgestreckten Produkts aus einem dickflüssigen abbindenden Werkstoff, wie zum Beispiel Beton oder einem ähnlichen Werkstoff, das mit einer sich längs erstrekkenden Armierung (14) und mindestens örtlich mit einer verstärkenden Armierung (8) ausgestattet ist, wobei die Vorrichtung versehen ist mit:

- einem unteren Formungsteil (1), das sich über die im Prinzip unbegrenzte Länge des herzustellenden langgestreckten Produkts erstreckt, sowie Lagerungsmitteln zum Positionieren der sich längs erstreckenden Armierung;
- einem Verformungselement (10) zum Liefern der verstärkenden Armierung (8) in einer Schraubengangform;
- einem Zuführelement (2) für den dickflüssigen abbindenden Werkstoff, und
- Formungsmitteln (1, 12) zum Bringen des dickflüssigen abbindenden Werkstoffs in die gewünschte Form auf der und um die Armierung,

wobei das Zuführelement (2) und das Verformungselement (10) in einem Abstand zueinander angeordnet sind und in der Längsrichtung des unteren Formungsteils (1) beweglich sind,
dadurch gekennzeichnet,
dass das Verformungselement (10) einen Auslass hat, der relativ zum Zuführelement (2) stromaufwärts angeordnet ist und mit einem Raum in offener Kommunikation ist, der über dem unteren Formungsteil (1) angeordnet ist, wobei in diesem Raum eine vorbestimmte Länge einer verstärkenden Armierung (8) um die sich längs erstreckende Armierung (14), die zuvor in diesem Raum angeordnet wurde, in einer schraubengangförmig rotierenden Weise vorgesehen werden kann.

9. Vorrichtung nach Anspruch 8,
dadurch gekennzeichnet,
dass zwischen dem Verformungselement (10) und dem Zuführelement (2) mindestens ein Verbindungselement angeordnet ist.

10. Vorrichtung nach Anspruch 8 oder 9,
dadurch gekennzeichnet,
dass das Verformungselement (10) so konstruiert ist, dass die schraubengangförmige verstärkende Armierung (8) mit einem variabel einstellbaren Durchmesser konstruiert werden kann.

11. Vorrichtung nach einem der Ansprüche 8 bis 10,
dadurch gekennzeichnet,
dass das Verformungselement (10) so konstruiert ist, dass die schraubengangförmige verstärkende Armierung (8) mit einer variabel einstellbaren Ganghöhe konstruiert werden kann.

12. Vorrichtung nach einem der Ansprüche 8 bis 11,
dadurch gekennzeichnet,
dass stromaufwärts gesehen vor dem Zuführelement (2) Führungsmittel (22) zum Positionieren der verstärkenden Armierung (8) angeordnet sind, die entfernbar sind.

13. Vorrichtung nach einem der Ansprüche 8 bis 12,
dadurch gekennzeichnet,
dass in einer geringen Entfernung stromaufwärts von dem Verformungselement (10) Führungsmittel (22) zum Positionieren oder Umpositionieren der sich längs erstreckenden Armierung (14) angeordnet sind, die entfernbar sind.

14. Vorrichtung nach einem der Ansprüche 8 bis 13,
dadurch gekennzeichnet,
dass beim Verformungselement (10) ein Schneidmittel (11) angeordnet ist.

15. Langgestrecktes Produkt, das aus einem dickflüssigen abbindenden Werkstoff, wie zum Beispiel Beton oder einem ähnlichen Werkstoff, hergestellt wird und mit einer Armierung ausgestattet ist, die aus einer sich längs erstreckenden Armierung (14) besteht, die aus einer Anzahl vorgespannter Drähte oder Stangen zusammengesetzt ist, die zueinander in regelmäßigen Abständen verteilt und in einem Mantelbereich angeordnet sind,
dadurch gekennzeichnet,
dass örtlich eine verstärkende Armierung (8) vorge-

sehen ist, die aus mindestens einem schraubengangförmig gebogenen Draht oder einer schraubengangförmig gebogenen Stange besteht, die um die sich längs erstrekkende Armierung (14) fortschreitet und die auf der sich längs erstreckenden Armierung (14) befestigt ist.

16. Langgestrecktes Produkt nach Anspruch 15, **dadurch gekennzeichnet,**
dass die verstärkende Armierung (8) eine kontinuierlich oder in einer Vielzahl von Winkeln gebogene Form hat, mit einem Wicklungsteil, der einen kleineren freien Durchgang hat als ein Wicklungsteil, der diesem vorangeht oder diesem folgt.

17. Langgestrecktes Produkt nach Anspruch 15 oder 16, **dadurch gekennzeichnet,**
dass die schraubengangförmige verstärkende Armierung (8) über eine bestimmte Länge eine kleinere Ganghöhe hat als ein Teil, der diesem vorangeht oder diesem folgt.

Revendications

1. Procédé pour fabriquer un produit allongé à partir d'un matériau durcissant visqueux tel que du béton ou un matériau similaire, comportant un renfort longitudinal (14) et, au moins localement, un renfort de consolidation hélicoïdal (8), dans lequel sur un dispositif de mise en forme, sur la longueur du produit allongé à fabriquer, un renfort longitudinal (14) est créé, alors que, à un endroit voulu et sur une longueur voulue par rapport à celui-ci, le renfort de consolidation transféré à partir d'un emplacement de transfert est positionné, et le matériau durcissant visqueux est fourni dans la forme voulue sur et autour du renfort à partir d'un élément d'alimentation (2) qui est maintenu en aval à distance devant l'emplacement de transfert, alors que la fourniture du matériau durcissant visqueux est démarrée près une première extrémité du renfort longitudinal (14) et, ultérieurement, est poursuivie dans la direction d'une seconde extrémité du renfort longitudinal (14) positionnée en face de la première extrémité, **caractérisé en ce que** le renfort de consolidation hélicoïdal (8) est formé et fixé directement sur et autour du renfort longitudinal (14).

2. Procédé selon la revendication 1, **caractérisé en ce que** le renfort de consolidation hélicoïdal (8) est conçu en ayant au moins une partie d'enroulement ayant un diamètre plus petit qu'une partie d'enroulement qui la précède ou qui la suit.

3. Procédé selon la revendication 2, **caractérisé en ce que** seule une partie d'enroulement transférée en dernier est une partie d'enroulement ayant un diamètre plus petit.

4. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le renfort de consolidation (8) est fixé sur le renfort longitudinal (14) à au moins un emplacement, à l'aide d'un élément de liaison.

5. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le renfort de consolidation (8) est agencé sur le renforcement longitudinal (14) à au moins un emplacement, par un traitement à la colle, sous pression ou à la chaleur.

6. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le renfort de consolidation hélicoïdal (8) est acheminé en ayant un pas qui, sur une longueur particulière du renfort longitudinal (14), est réglé par rapport à une quantité voulue du renfort de consolidation (8) sur la longueur particulière.

7. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** dans une zone en amont par rapport à l'emplacement de transfert, le renfort longitudinal (14) est positionné ou repositionné dans des positions qui sont mutuellement souhaitables et souhaitables par rapport au dispositif de mise en forme.

8. Dispositif pour fabriquer un produit allongé à partir d'un matériau durcissant visqueux tel que du béton ou un matériau similaire, et comportant un renfort longitudinal (14), et, au moins localement, un renfort de consolidation (8), lequel dispositif comporte

- une partie inférieure de mise en forme (1) s'étendant sur la longueur, en principe, illimitée du produit allongé à fabriquer et des moyens de support pour positionner le renfort longitudinal,
- un élément de déformation (10) pour créer le renfort de consolidation (8) ayant une forme hélicoïdale,
- un élément d'alimentation (2) pour le matériau durcissant visqueux, et
- des moyens de mise en forme (1, 12) pour mettre le matériau durcissant visqueux dans la forme voulue sur et autour du renfort,

dans lequel l'élément d'alimentation (2) et l'élément de déformation (10) sont agencés à distance l'un de l'autre et de manière mobile dans la direction longitudinale de la partie inférieure de mise en forme (1), **caractérisé en ce que** l'élément de déformation (10) a une sortie qui est placée en amont par rapport à l'élément d'alimentation (2) et qui est en communication ouverte avec un espace situé au-dessus de la partie inférieure de mise en forme (1), espace dans

lequel, selon une manière hélicoïdalement rotative, une longueur prédéterminée du renfort de consolidation (8) peut être créée autour du renfort longitudinal (14) précédemment positionné dans cet espace.

9. Dispositif selon la revendication 8, **caractérisé en ce qu'**entre l'élément de déformation (10) et l'élément d'alimentation (2), au moins un élément de liaison est agencé.

10. Dispositif selon la revendication 8 ou 9, **caractérisé en ce que** l'élément de déformation (10) est conçu de telle sorte que le renfort de consolidation hélicoïdal (8) peut être conçu en ayant un diamètre variable réglable.

11. Dispositif selon l'une quelconque des revendications 8 à 10, **caractérisé en ce que** l'élément de déformation (10) est conçu de telle sorte que le renfort de consolidation hélicoïdal (8) peut être conçu en ayant un pas variable réglable.

12. Dispositif selon l'une quelconque des revendications 8 à 11, **caractérisé en ce que** vu en amont, devant l'élément d'alimentation (2), des moyens de guidage (22) pour positionner le renfort de consolidation (8) sont positionnés, lesquels moyens de guidage sont amovibles.

13. Dispositif selon l'une quelconque des revendications 8 à 12, **caractérisé en ce qu'**en amont, à une petite distance par rapport à l'élément de déformation (10), les moyens de guidage (22) pour positionner ou repositionner le renfort longitudinal (14) sont positionnés, lesquels moyens de guidage sont amovibles.

14. Dispositif selon l'une quelconque des revendications 8 à 13, **caractérisé en ce que** sur l'élément de déformation (10), des moyens de coupe (11) sont agencés.

15. Produit allongé fabriqué à partir d'un matériau durcissant visqueux tel que du béton ou un matériau similaire, et muni d'un renfort formé d'un renfort longitudinal (14) constitué de plusieurs fils ou tiges en biais, mutuellement répartis de manière régulière et agencés dans une zone circonférentielle, **caractérisé en ce que** localement, un renfort de consolidation (8) est créé, qui est constitué d'au moins un fil ou une tige plié hélicoïdalement continuant autour du renfort longitudinal (14) et qui a été fixé sur le renfort longitudinal (14).

16. Produit allongé selon la revendication 15, **caractérisé en ce que** le renfort de consolidation (8) a une forme pliée de manière continue ou multi-angulaire, une partie d'enroulement ayant un passage libre plus petit qu'une partie d'enroulement qui la précède ou qui la suit.

17. Produit allongé selon la revendication 15 ou 16, **caractérisé en ce que** sur une longueur particulière, le renfort de consolidation hélicoïdal (8) a un pas plus petit qu'une partie qui la précède ou qui la suit.

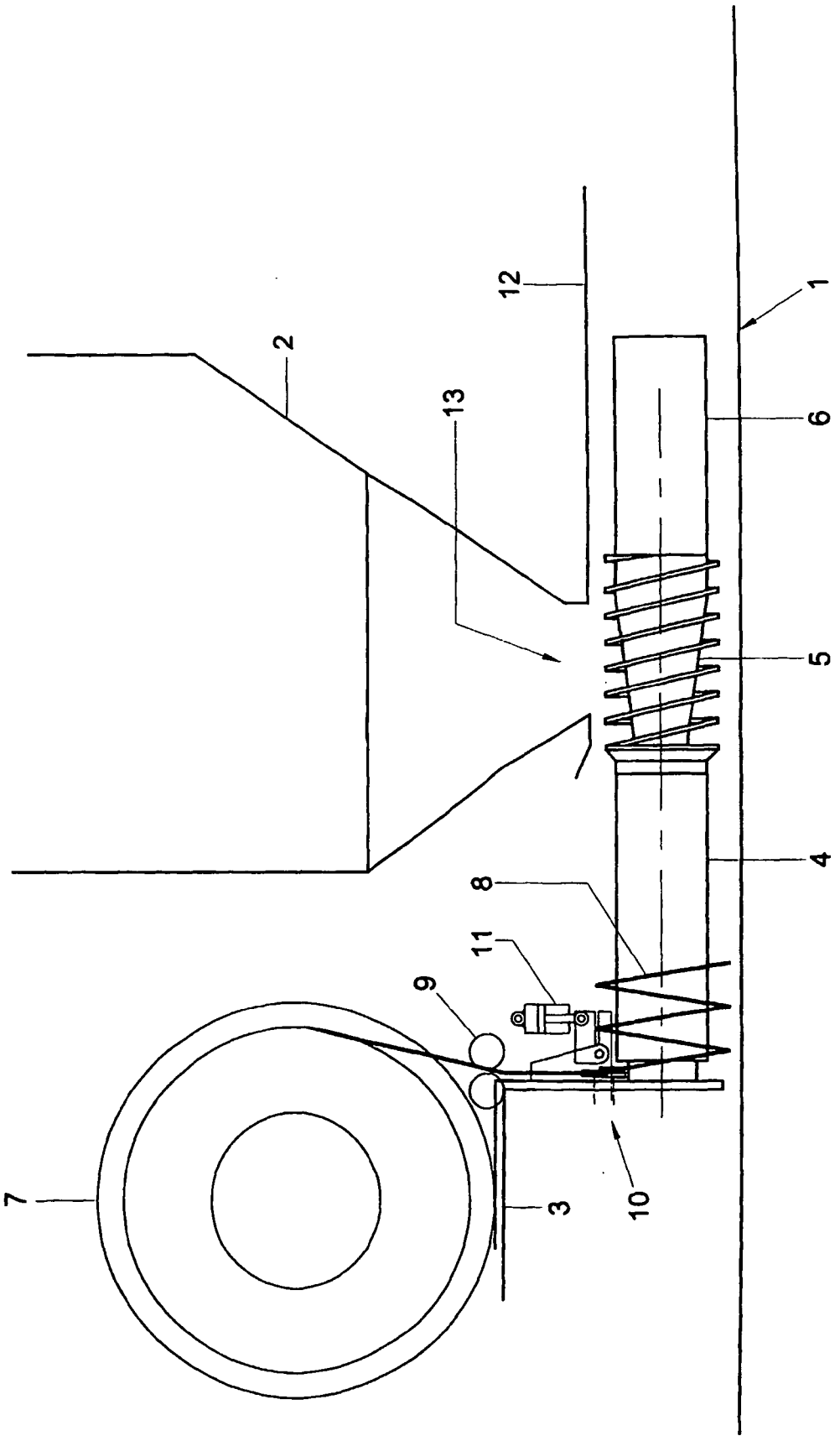

Fig. 1

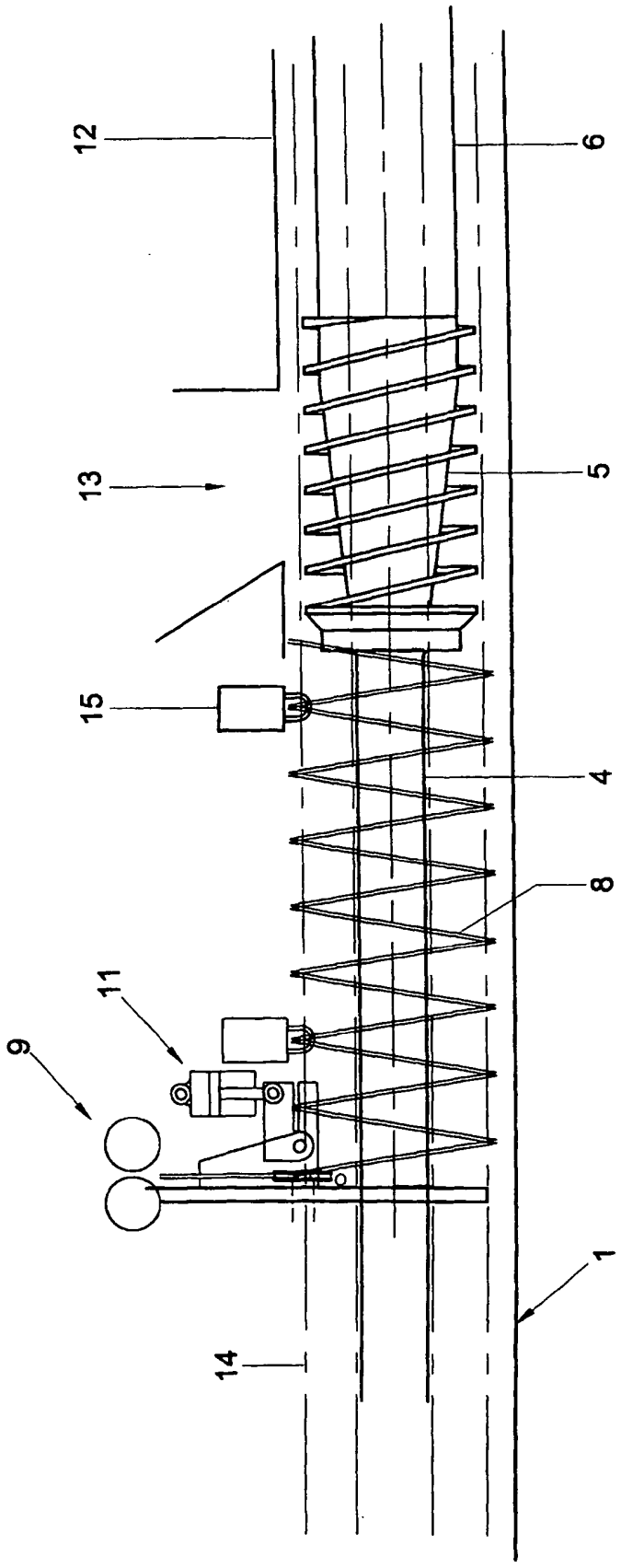

Fig. 2

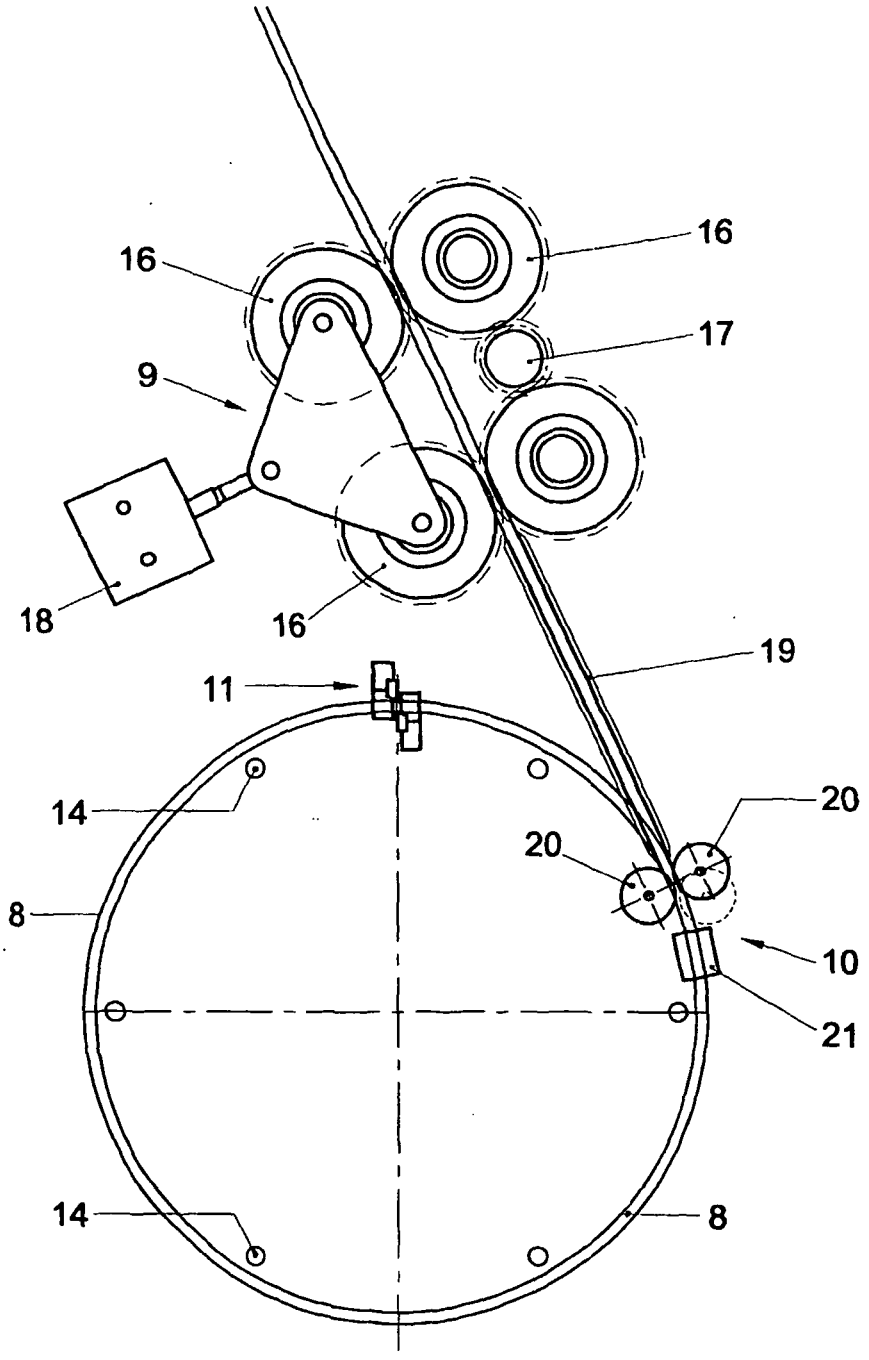

Fig. 3

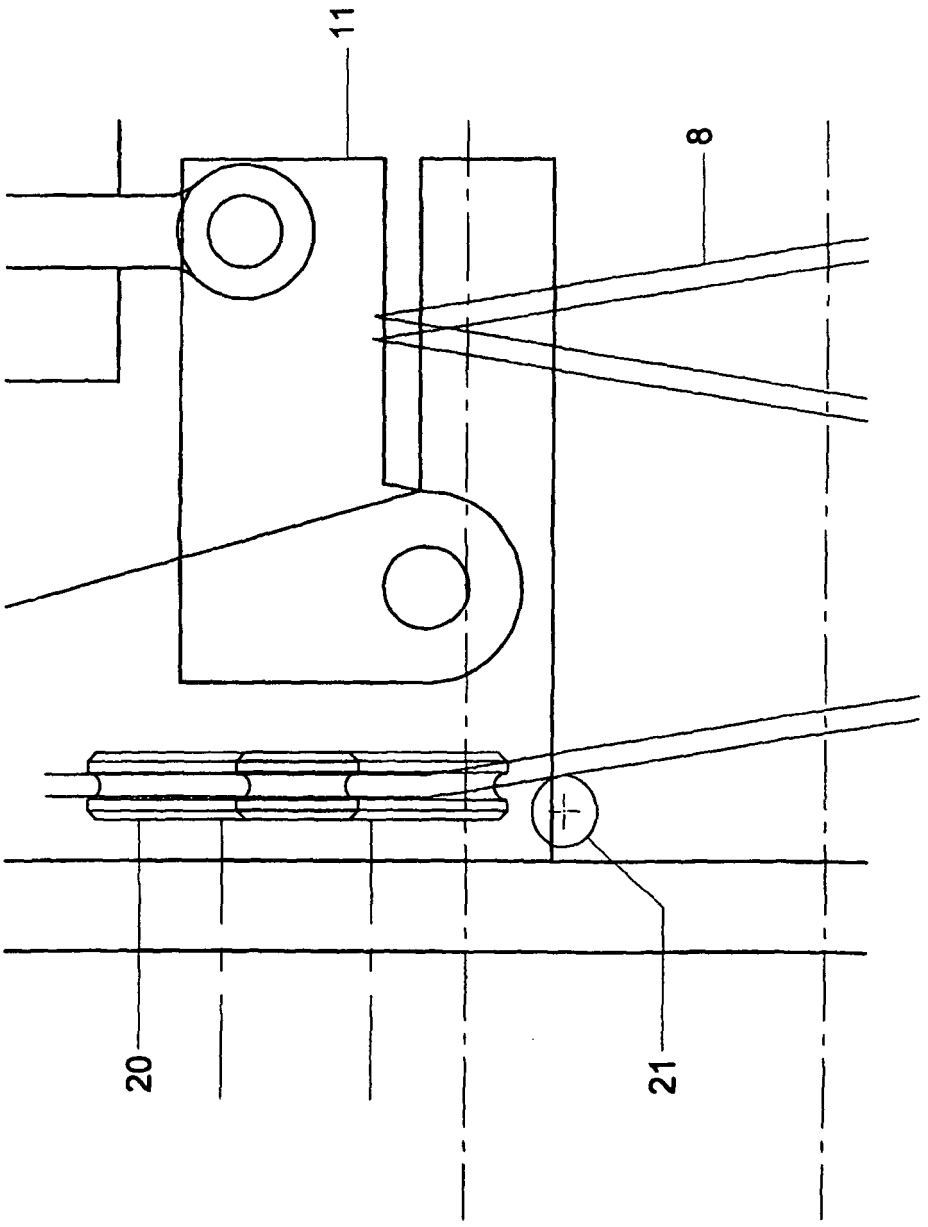

Fig. 4

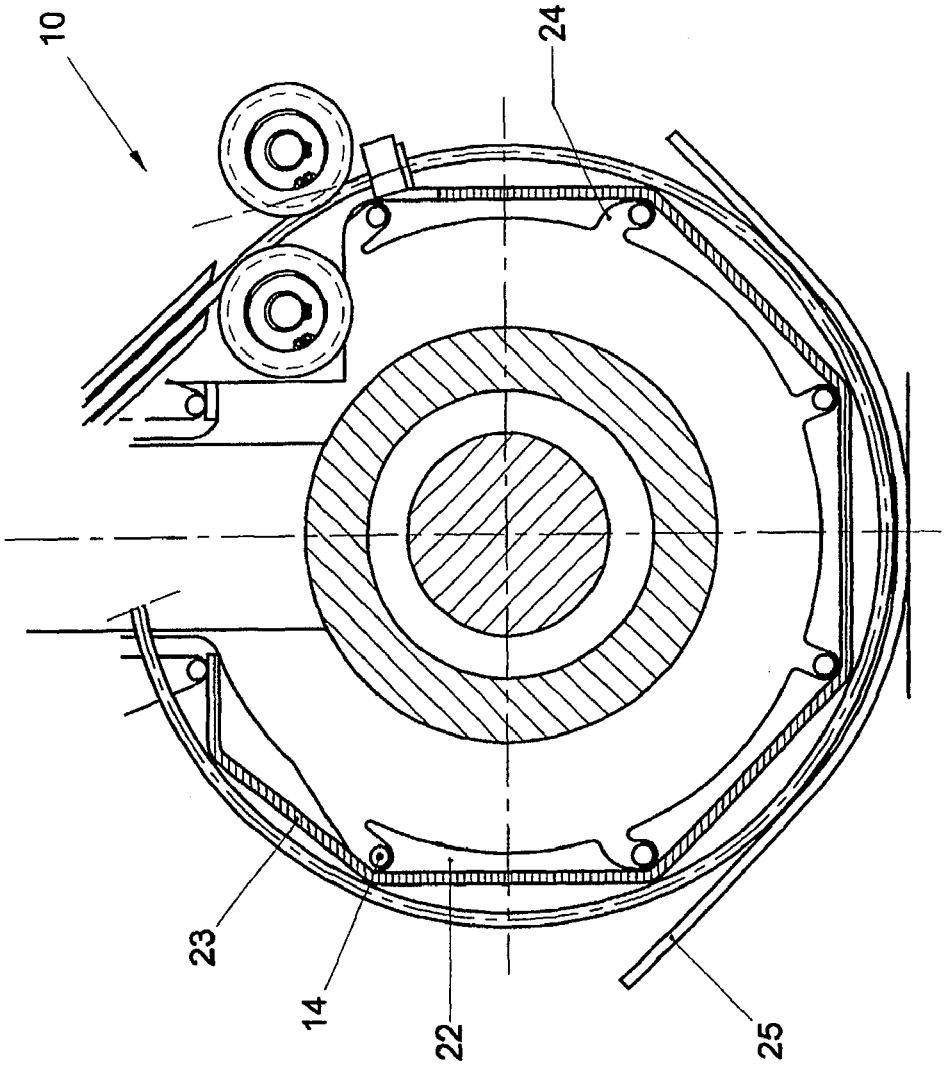

Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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