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(54) **METHOD AND APPARATUS FOR WRAPPING A WEB-LIKE PRODUCT INTO A WRAPPER**

Verfahren und Vorrichtung zum Verpacken eines bahnförmigen Produktes in einer Verpackungshülle

PROCEDE ET APPAREIL D'EMBALLAGE D'UN PRODUIT DE TYPE BANDE DANS UN EMBALLEUR

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(56) References cited:
DE-A1- 3 431 177
GB-A- 1 011 281
US-A- 4 173 112

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Description

[0001] The present invention relates to a method of automatically feeding a separate Wrapper around a web-like product, for example a paper web being reeled in connection with a slitter-winder, and to an apparatus for practicing this method.

[0002] GB-A-1011201 discusses a process and an apparatus for automatic rolling and packaging of products in strip form. The process is especially suitable for packaging glass fiber mats or similar products. The process is based on rolling a strip of certain lengthon itself, and then packaging such before the next strip is brought to the rolling station. In other words, the strip moves stepwise a certain length at a time, whereby the discussed process and apparatus are not suitable for continuous production.

[0003] In the prior art when a reel is completed, the slitter-winder is stopped and a separate wrapper is glued onto the web being reeled, after which the machine is started again for the feeding of the wrapper. This method of feeding a wrapper is very slow and cumbersome. Even up to almost 50 % of the machine time is consumed in the process of forming the wrapper to be adjusted onto the surface of the reel being completed.

[0004] In the prior art a separate wrapper is formed onto the surface of the reel for example as follows. When the predetermined amount of the reel being completed is achieved, the slitter-winder stops automatically at this amount. After this the operators of the machine apply a precut wrapper onto the surface of the reel being completed and tape it onto the paper. The slitter-winder is started again at a creep speed of 15 m/min and the wrapper is run at this speed onto the surface of the completed reel.

[0005] When the number of layers of the wrapper + web being reeled determined by the length of the wrapper have been applied to the surface of the reels, the machine is stopped and the reel is removed from the machine manually. Subsequently, a new core is placed in the reeling position. The forward edge of the paper is taped onto the surface of the core for a new reeling. After this the machine is ready for a new reeling. The adjustment and taping of said wrapper takes about 8 - 15 minutes, all of which is so-called machine time.

[0006] Thus, with the existing methods, the reeling of the web has to be halted for affixing a separate wrapper to the surface of a reel being completed. Naturally, this takes time away from the efficient working time i.e. the machine time of e.g. a slitter-winder.

[0007] A purpose of the invention is to eliminate the above-mentioned disadvantages and to provide an improved method and apparatus for feeding a separate wrapper. These objectives may be reached by means of the characteristic features of the invention disclosed in the appended patent claims.

[0008] The main objectives of the invention are reached, on the one hand, by adjusting the feeding speed of the wrapper accurately and steplessly during the packaging of the roll. This is accomplished by using an inverter for controlling the wrapper feed motor. On the other hand, also the reeling speed of the product is decelerated to match the wrapper feeding speed.

[0009] In the method of feeding a separate wrapper according to the invention a wrapper is applied onto the surface of a reel being completed, e.g. a paper reel, in connection with the normal functions of a machine, e.g. a slitter-winder, so that no halts restraining the production occur. The wrapper is wrapped around the reel being completed so that the wrapper + the web being completed move the whole time during the wrapping of the wrapper. Thus, the wrapper is wrapped around the reel being completed without having to stop the reel being completed or the web being reeled at the same time. The web being reeled is not stopped until the reel is complete and a wrapper has been wrapped around it.

[0010] The wrapper feeding apparatus and the method of automatically feeding a separate wrapper around a reel being completed according to the invention will be explained in more detail with reference to the accompanying figures. These figures illustrate an embodiment of the invention, in which embodiment a wrapper feeding apparatus has been arranged in connection with a slitter-winder. However, the invention is not intended to be limited to this single embodiment.

Figure 1 illustrates side view of a wrapper feeding apparatus

Figure 2 illustrates section A-A of the wrapper feeding apparatus in Figure 1.

[0011] Figure 1 illustrates side view of a wrapper feeding apparatus and Figure 2 illustrates section A-A of the wrapper feeding apparatus in Figure 1. Reference number 1 depicts a feed nip I comprising rolls 11 and 12, which feed nip I pulls and adjusts the wrapping of a wrapper web 10 from the stock reel to the wrapper apparatus. Reference number 2 depicts a feed nip II in which a roll 20 positioned against a spring-loaded strip 21 keeps the wrapper tight between the nips 1 and 2, whereby it is possible to cut the wrapper web in a controlled way. A cutter 3 has a stationary lower blade 31 and a rotating disc blade 32 attached to a shuttle cylinder, which disc blade, while moving, cuts the wrapper perpendicularly to the web. A transfer cylinder 41, which is driven by compressed air, moves a connecting roll 4 against a lower paper guide roll 70 to form a connecting nip. The lower paper guide roll of the slitter-winder is marked with reference number 70 and the upper paper guide roll with reference number 71. Reference number 5 depicts a toothed belt system used for rotating the connecting roll nips I and II. An inverter 6 guides an electric motor 61, which then rotates the rolls. Guide and supporting planes used in the feeding of the wrapper are marked with reference number 8. The wrapper 10 moves on top of these guide and supporting planes 8.

The web being reeled is marked with reference number 50.

[0012] In the following the method and apparatus i.e. the way of running according to the invention have been described when using a wrapper feeding apparatus. The normal production rate of a slitter-winder is approx. 1800 m/min. When the machine reaches the predetermined amount set for a reel being completed, a decelerating run begins during which the speed of the web 50 being reeled decreases to about 15 m/min, The change of the speed of the web 50 being treated on the slitter-winder and the reaching of the predetermined amount give the wrapper feeding apparatus the required guidance. Changes in the above-mentioned factors then activate the wrapper feeding apparatus in a preprogrammed way. When the speed of the slitter-winder has decreased to an appropriate speed, e.g. 15 m/min, the connecting roll 4 rises up forming a roll nip against the guide roll of the slitter-winder. The connecting roll 4 in top position is depicted by a broken line and reference number 4'. Thus, the uppermost roll 4 of the wrapper feeding apparatus rises up into contact with the paper guide roll of the machine and the wrapper feeding apparatus starts to feed the wrapper. After this the wrapper device is activated and the forward edge of the wrapper passes through the connecting nip. The forward edge of the wrapper is provided with a pre-adjusted two-sided adhesive tape, which as the wrapper passes through said nip, adheres to the paper web and affixes the wrapper to the paper web. Other convenient adhesive connection methods may also be used to affix the wrapper to the paper web. Supported and guided by the paper web the wrapper moves forward towards the reel being completed. When approx. 2 meters of the wrapper has been fed i.e. when the forward edge of the wrapper passes by the center line of the upper support roll 71, the uppermost nip, i.e. the nip of the connecting roll 4 opens and the speed of the wrapper feeding apparatus increases momentarily to about 25 m/min, whereby a loose wrapper web is formed between the nip 2 of the feeding device and the upper paper guide roll 71, the distance of the web formed being approximately twofold compared to a direct distance between the nip 2 and the paper guide roll 71. With the loose wrapper web obtained the wrapper feeding apparatus may be stopped while the paper web still moves forward normally. However, the tension of the web being rolled stays the same during the entire run. When the wrapper feeding apparatus stops after this acceleration, the wrapper web cutter 3 cuts the wrapper perpendicularly to the web. After the cutting the feed nips of the wrapper feeding apparatus are re-engaged and the tail of the wrapper is run out of the apparatus and the forward edge of a new wrapper is positioned in stand-by position for the adjustment of a forward edge adhesive tape for the next run and the feeding device stops. The slitter-winder continues to operate at creep speed until the tail of the wrapper fed is on the surface of the completed reel and the slitter-winder stops for the removal of the reels. The completed reel is changed as usual i.e. the machine stops, the paper web is cut, the tail. of the wrapper is affixed with adhesive tape to the surface of the reel and the reel is removed from the machine and replaced with anew core.

[0013] With the method and apparatus of our invention the reel being completed stops only once during a run and that too takes place when the completed reel wrapped in a separate wrapper is removed from the slitter-winder. Thus, there is no need to stop the slitter-winder for the adhesion and adjustment of the wrapper. Inverter motors are used to adjust both the reeling speed of 4 web-like product, e.g. paper web, and the feeding speed of the wrapper. As was stated earlier the wrapper feeding apparatus is guided by the change of the speed of the web 50 being treated on the slitter-winder and by the reaching of the predetermined amount, whereby it is activated. Thus, the inverter motor makes it possible to accurately and steplessly adjust the feeding speed of the wrapper and, in a run taking place in various speed ranges, to produce loose paper web "in a controlled way" for the cutting of the wrapper, although the paper web itself and the wrapper along with it advance uninterruptedly. It should be noted that the paper web itself and the wrapper along with it advance during the entire action of wrapping into a wrapper at a steady speed, e. g. 15 m/min, towards the reel being completed. The web being completed moves during the wrapping into a wrapper at a speed considerably slower than 50 m/min, preferably in the range 1 - 30 m/min and particularly preferably in the range of about 5 - 20 m/min When the stock reel ends the machine stops and the reel is replaced with a new one after which the new and the old web are affixed to each other with adhesive tape. After this the run continues normally. A length counter in the machine monitors the length of the web of the reel being completed and that of the web leaving the stock reel. The stops of the machine are based on this counting.

[0014] With the method and apparatus of our invention both the forward end and the tail of the wrapper being formed around the reel being completed may be glued onto the paper web being reeled itself. This ensures that the wrapper stays well in place for example during subsequent packing and transport. If the forward end of the wrapper being formed around the reel being completed were just tucked between the paper turns, i. e. the forward end of the wrapper were not glued onto the paper web itself and only the tail were glued onto the paper web being reeled, the result would be a packing, with a poor tolerance of handling.

[0015] The normal production rate of a slitter-winder is approx. 1800 m/min. At the beginning of the reeling (until the diameter of the reel is about 35 cm) the machine operates at a speed of about 1000 m/min, after which the speed rises to the normal production rate.

[0016] With the method and apparatus of our invention it is possible to reach a machine time saving of about 5 - 10 min/reel being treated compared to the prior art

method i.e. the manual adjustment of the wrapper onto a reel, constituting a saving corresponding to approx. a third of the daily production time in the case of fast production machinery. Thus, a very considerable improvement of about 20 - 30 % in the delivery cycle of a complete roll is in question compared to the prior art in use today.

[0017] The invention has been described above by means of one preferred embodiment thereof, only. Naturally, this is by no means intended to restrict the present invention, and it will be apparent to those skilled in the art that many alternative and optional modifications and structural alternatives thereof are possible within the scope of the invention determined by the appended claims.

Claims

1. A method of wrapping a web-like product, e.g. paper, into a separate wrapper (10) in connection with the reeling of said product, said method comprising

   a) decelerating the reeling speed of said product (50) to below 50 m/min,
   b) attaching the forward edge of the wrapper (10) to said product (50),
   c) feeding a predetermined length of the wrapper (10) to advance with the product (50),
   d) increasing the speed of the wrapper feeding apparatus (11, 12, 20) to arrange loose wrapper (10),
   e) stopping the wrapper feeding apparatus (11, 12, 20)
   f) cutting the wrapper (10), and
   g) allowing the wrapper (10) to be wrapped around the reel to be formed, wherein an inverter controlled motor (6, 61) is used to adjust both the reeling speed of said product, e.g. paper web, and the feeding speed of the wrapper (10),

   wherein the reel rotates continuously during the steps a) through g).

2. A method according to claim 1, **characterized in** between steps a) and b) starting the wrapper feeding apparatus, and advancing the wrapper (10) into contact with the product (50).

3. A method according to claim 1, **characterized in that** the reel being completed rotates during the wrapping of the wrapper (10) at a speed of, preferably in the range 1 - 30 m/min and particularly preferably in the range of about 5 - 20 m/min.

4. A method according to claim 1 or 3, **characterized in that** both the forward edge and the tail of the wrapper (10) are affixed to the reel being completed with a convenient adhesive connection method, for example with two-sided adhesive tape.

5. An apparatus for feeding a wrapper (10) around a reel being completed, which apparatus comprises

   - a first feed nip (1) comprising rolls (11) and (12) for feeding wrapper (10) from the stock roll to the wrapping apparatus,
   - a second feed nip (2) comprising a roll (20) and a spring-loaded strip (21) for keeping the wrapper tight between the first and second nip,
   - a wrapper cutter (3) for cutting the wrapper perpendicularly to the web, said cutter (3) being arranged between the first and the second nip,
   - guide and supporting planes (8) for the wrapper (10) after the second nip (2),
   - a connecting roll (4, 4') which is moved by a compressed-air cylinder (41) against a guide roll (70) of the product to form a connecting nip (70, 4'),
   - an electric motor (61) for rotating rolls (11, 20) by means of an actuator (5), e.g. a toothed belt system (5),

   characterized in

   - an inverter (6) for controlling the motor (61) in order to adjust the feeding speed of a wrapper (10) accurately and steplessly in the first feed nip (1).

Patentansprüche

1. Verfahren zur Einwicklung eines bahnförmigen Produkts, z. B. von Papier in einen getrennten Umschlag (10) in Verbindung mit der Aufrollung des Produkts, das Verfahren bestehend aus

   a) Herabsetzung der Aufrollgeschwindigkeit des Produkts (50) auf unter 50 m/min,

   b) Befestigung der Vorderkante des Umschlags (10) an dem Produkt (50),

   c) Zuführung einer vorbestimmten Länge des Umschlags (10), damit es sich mit dem Produkt (50) vorwärts bewegt,

   d) Erhöhung der Geschwindigkeit der Umschlagsvorschubvorrichtung (11, 12, 20), um für schlaffen Umschlag (10) zu sorgen,

   e) Anhalten der Umschlagsvorschubvorrichtung (11, 12, 20)

   f) Kappen des Umschlags (10), und

g) Veranlassen, dass der Umschlag (10) um die zu bildende Rolle gewickelt wird, wobei ein Inverter-gesteuerter Motor (6, 61) benutzt wird, um sowohl die Aufrollgeschwindigkeit des Produkts, z. B. der Papierbahn, und die Vorschubgeschwindigkeit des Umschlags (10) einzustellen,

wobei die Rolle während der Schritte a) bis g) kontinuierlich dreht.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die Umschlagsvorschubvorrichtung zwischen den Schritten a) und b) eingeschaltet wird und der Umschlag (10) sich zum Kontakt mit dem Produkt (50) bewegt.

3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die fertig zu stellende Rolle während des Wickelns des Umschlags (10) mit einer Geschwindigkeit bevorzugt im Bereich von 1 - 30 m/min und besonders bevorzugt im Bereich von ungefähr 5 - 20 m/min dreht.

4. Verfahren nach Anspruch 1 oder 3, **dadurch gekennzeichnet, dass** sowohl die Vorderkante als auch das hintere Ende des Umschlags (10) an der fertig zu stellenden Rolle durch ein geeignetes Klebstoff-Verbindungsverfahren, zum Beispiel mit zweiseitigem Klebeband befestigt werden.

5. Vorrichtung für den Vorschub eines Umschlags (10) um eine fertig zu stellende Rolle, die Vorrichtung bestehend aus,

- einem ersten Walzenspalt (1) mit Walzen (11) und (12) zur Zuführung von Umschlag (10) von der Lagerrolle zur Umschlagsvorrichtung,
- einem zweiten Walzenspalt (2) mit einer Walze (20) und einer Federbelasteten Leiste (21), um den Umschlag zwischen dem ersten und zweiten Walzenspalt stramm zu halten,
- einem Umschlagsmesser (3) fürs Kappen des Umschlags senkrecht zur Bahn, welches Messer (3) zwischen dem ersten und dem zweiten Walzenspalt angeordnet ist,
- Leit- und das Stützebenen (8) für den Umschlag (10) nach dem zweiten Walzenspalt (2),
- einer Verbindungswalze (4, 4'), die mit einem Druckluftzylinder (41) gegen eine Leitwalze (70) des Produkts bewegt wird, um einen Verbindungs-Walzenspalt zu bilden (70, 4')
- einem Elektromotor (61) fürs Drehen von Walzen (11, 20) mittels eines Stellantriebs (5), z. B. eines Zahnriemensystems (5),

gekennzeichnet durch

- einen Inverter (6) zur Ansteuerung des Motors (61), um die Vorschubgeschwindigkeit eines Umschlags (10) präzise und stufenlos im ersten Walzenspalt (1) einzustellen.

Revendications

1. Procédé pour emballer un produit tel qu'une feuille continue, par exemple un papier, dans un emballage (10) séparé en relation avec l'enroulage dudit produit, ledit procédé consistant en :

a) décélérer la vitesse d'enroulage dudit produit (50) à un niveau inférieur à 50 m/min,
b) attacher le bord avant de l'emballage (10) audit produit (50),
c) alimenter une longueur déterminée d'emballage (10) afin d'avancer avec le produit (50),
d) augmenter la vitesse de l'appareil d'alimentation d'emballage (11, 12, 20) pour permettre un emballage lâche (10),
e) arrêter l'appareil d'alimentation d'emballage (11, 12, 20),
f) couper l'emballage (10), et
g) permettre l'emballage (10) d'être emballé autour de la bobine à former, de façon qu'un moteur (6, 61) contrôlé par un onduleur est utilisé pour régler aussi bien la vitesse d'enroulage dudit produit, par exemple du papier, que la vitesse d'alimentation de l'emballage (10),

de façon que la bobine tourne continuellement pendant les étapes de a) à g).

2. Procédé selon la revendication 1 **caractérisé en ce qu'**on démarre l'appareil d'alimentation d'emballage, entre les étapes a) et b), et on avance l'emballage (10) en contact avec le produit (50).

3. Procédé selon la revendication 1 **caractérisé en ce que** la bobine, qui est entrain d'être formée, tourne pendant l'emballage de l'emballage (10) à une vitesse de, préférablement au sein de l'échelle allant de 1 à 30 m/min et particulièrement préférablement au sein de l'échelle allant environ de 5 à 20/min.

4. Procédé selon la revendication 1 ou 3 **caractérisé en ce que** aussi bien le bord d'avant que le fin de l'emballage (10) sont fixées sur la bobine en train d'être formée à l'aide d'un moyen de connexion par adhésif, par exemple avec une bande adhésive avec deux faces.

5. Appareil pour alimenter un emballage (10) autour d'une bobine qui est en train d'être formée lequel appareil comprend

- une première ligne de contact (1) d'alimentation comprenant cylindres (11) et (12) pour alimenter l'emballage (10) à partir d'une bobine de stock vers l'appareil d'emballage,
- une deuxième ligne de contact (2) d'alimentation comprenant un cylindre (20) et une bande à ressort (21) pour garder l'emballage serré entre la première et la seconde ligne de contact,
- une coupeuse (3) pour couper l'emballage perpendiculairement à la feuille, ladite coupeuse étant positionnée entre la première et la seconde ligne de contact,
- plans (8) de guidage et de support pour l'emballage (10) après la seconde ligne de contact,
- un cylindre de liaison (4, 4') qui est déplacé par un cylindre (41) d'air comprimé contre un cylindre de guidage (70) du produit pour former une ligne de contact (70, 4'),
- un moteur électrique (61) pour tourner les cylindres (11, 20) au moyen d'un organe de commande (5), par exemple un système de tapis dentelé (5),

caractérisé en ce qu'un onduleur (6) pour contrôler le moteur (61) pour régler la vitesse d'alimentation de l'emballage (10) avec précision et progressivement dans la première ligne de contact (1) d'alimentation.

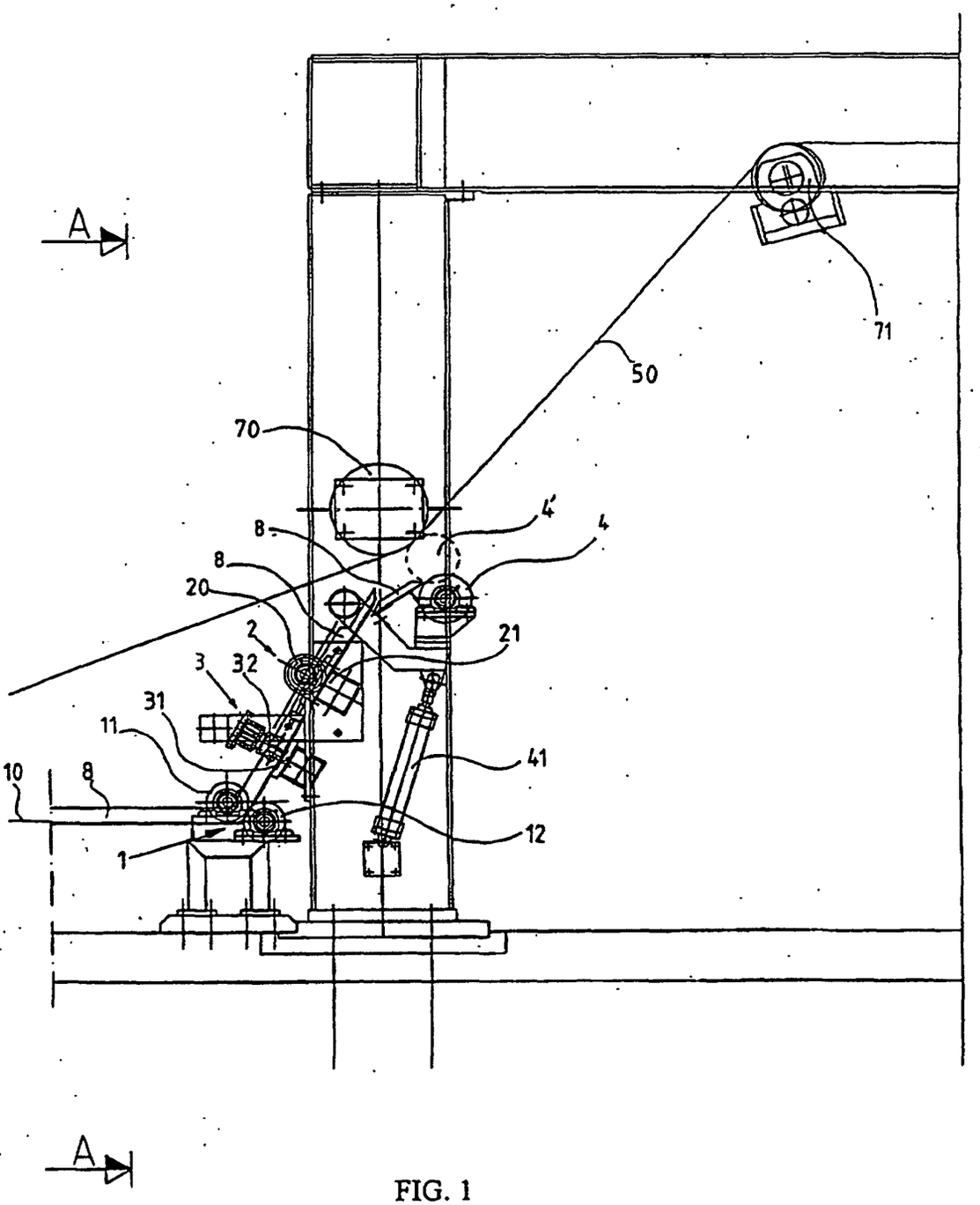

FIG. 1

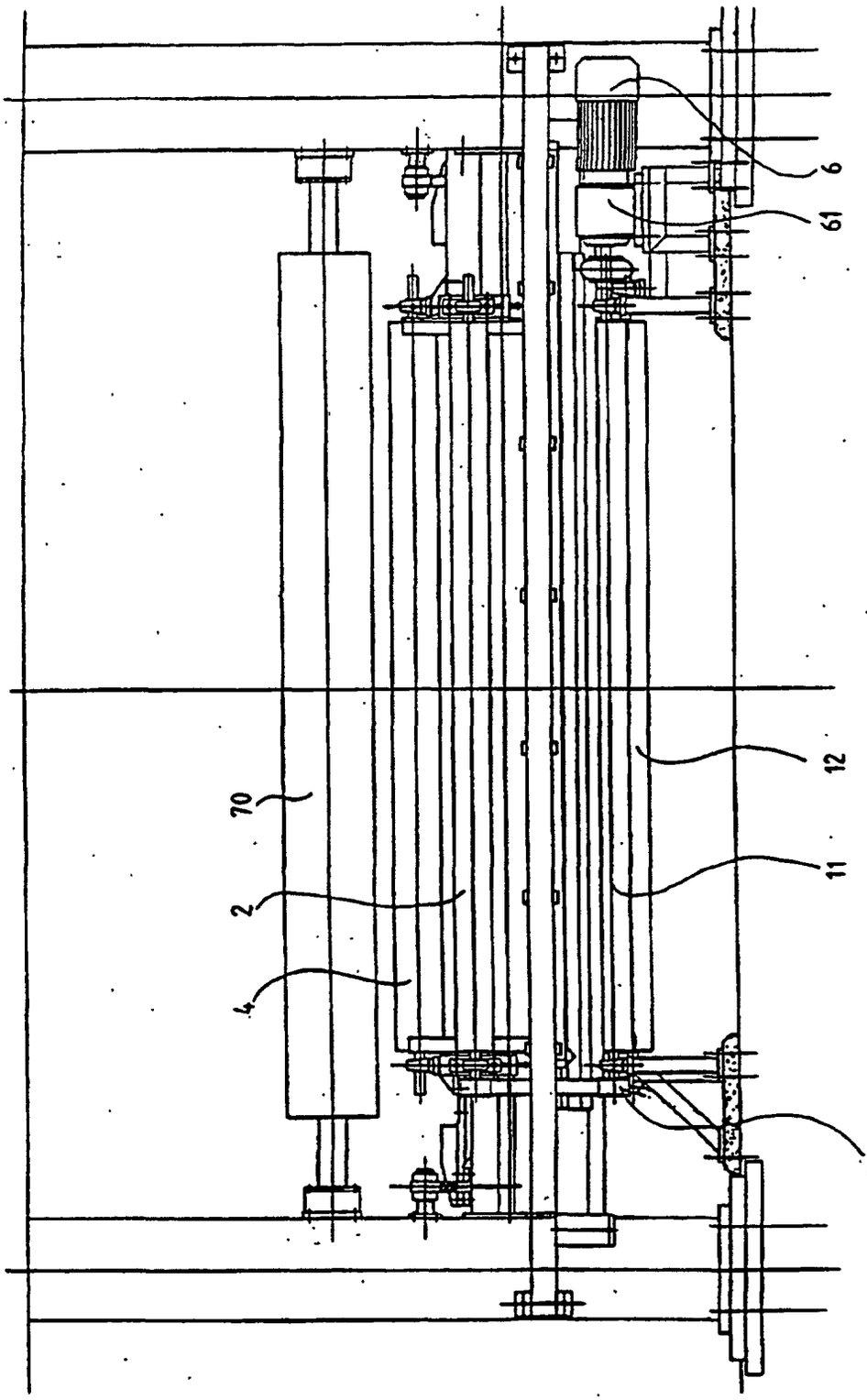

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FIG. 2