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(54) **UNREELING ASSEMBLY, PARTICULARLY FOR LABELING DEVICES**

ABSPULANORDNUNG, INSBESONDERE FÜR ETIKETTIERUNGSVORRICHTUNGEN

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Description

Technical field

[0001] The present invention relates to an unreeling assembly, particularly for labeling devices.

Background Art

[0002] Currently, some types of labeling devices for containers such as bottles or jars have means of feeding bands of film to applicator elements, of various types, which are designed to apply the labels to the containers.

[0003] The feeding means have, generally, an unreeling assembly, which is typically comprised of two reels of continuous film which are supported by a respective reel support; from one of the two reels, by the action of a traction drum, the continuous film is unreeled and is then cut by a cutting assembly arranged downstream of the unreeling assembly, in order to then be sent to the applicator elements.

[0004] Between the "working" reel, i.e. the reel from which the continuous film is unreeled, and the traction drum a plurality of return rolls are normally interposed, as well as a tensioning dandy roll.

[0005] The unreeling assembly, in addition to feeding the continuous film to the cutting assembly to be cut, also has the function of correctly tensioning the film, longitudinally, by the action of the tensioning dandy roll.

[0006] In some cases, there is an "end of reel" sensor on the unreeling assembly, which sensor is designed to detect when the reel being unreeled is about to be depleted.

[0007] In some unreeling assemblies, the reel supports are associated with respective servomotors; in these cases, there are means of detecting the reel radius, which are normally constituted by a sensor (optical, laser or mechanical), which precisely measures the radius of the reel being unreeled so as to make it possible to alter the angular velocity of the reel support as well as, in some cases, to know when the reel is about to be depleted.

[0008] In particular, measuring the radius of the reel being unreeled makes it possible to determine the angular velocity of the reel support so as to control the position of the tensioning dandy roll and, consequently, the tensioning of the continuous film being unreeled.

[0009] Although the unreeling assemblies described above are widely used, they are not without drawbacks.

[0010] In particular, measuring the radius suffers, perceptibly, from possible detection errors or tolerances on the part of the sensors.

[0011] In some cases, furthermore, the sensor for measuring the reel radius is positioned close to areas that are the focus of operations (such as changing reels): this leads to the risk that they can undergo impacts or movements with the consequent necessity of performing adjustments, calibrations or replacements.

[0012] Lastly, the various sensors used have associ-

ated installation, maintenance and running costs.

[0013] US 4 286 757 A discloses a brake control system for an unwinder which measures the line speed of the moving web and the rpm of the roll and produces electrical output signals proportional to each, which signals are operated upon to produce a main brake control signal to apply a braking force proportional to the roll diameter as it is constantly decreasing, and a further output signal which is proportional to the energy in the roll based on the calculation of the cube of the diameter of the roll so that required braking force modification will occur during acceleration and deceleration of the web in order to maintain essentially constant web tension.

Disclosure of the Invention

[0014] The aim of the present invention is to solve the above-mentioned problems and overcome the above-mentioned drawbacks, by providing an unreeling assembly, particularly for labeling devices, which is considerably easier and more practical to use than the unreeling assemblies of known types that are used today.

[0015] Within this aim, an object of the invention is to make available an unreeling assembly, particularly for labeling devices, that estimates the reel radius with exceptional precision.

[0016] Another object of the invention is to provide an unreeling assembly, particularly for labeling devices, that can be made at low cost so as to make its use advantageous also from an economic viewpoint.

[0017] This aim, as well as these and other objects which will become more evident hereinafter, are achieved by an unreeling assembly, particularly for labeling devices, comprising a supporting frame for at least one reel of continuous film which is supported by a respective reel support and can rotate about an unreeling axis of the reel and a motorized traction drum, which is designed to unreel said continuous film from said reel of continuous film, where between said reel of continuous film and said traction drum at least one tensioning element is provided, which is movable, with respect to said supporting frame, along a respective movement path, characterized in that it comprises means for estimating the radius of said reel of continuous film as a function of the data related to the angular velocity of said reel, to the speed of the film drawn by the traction drum and to the position of the tensioning element with respect to said supporting frame along the respective movement path.

Brief description of the drawings

[0018] Further characteristics and advantages of the invention will become better apparent from the following detailed description of some preferred, but not exclusive, embodiments of an unreeling assembly, particularly for labeling devices, according to the invention, illustrated by way of nonlimiting example in the accompanying drawings, wherein:

Figure 1 is a schematic view of a first embodiment of an unreeling assembly according to the invention; Figures 2, 3 and 4 are also schematic views of three possible embodiments of an unreeling assembly according to the invention.

Ways of carrying out the invention

[0019] In the embodiments that follow, individual characteristics shown in relation to specific examples may in reality be interchanged with other, different characteristics, existing in other embodiments.

[0020] Moreover, it should be noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0021] With reference to the figures, the present invention relates to an unreeling assembly, generally indicated with the reference numeral 1, particularly for labeling devices.

[0022] The unreeling assembly 1 comprises, in particular, a supporting frame 2 for at least one reel 3 of continuous film 10 which will be cut for making the labels.

[0023] The reel or each reel 3 is supported by a respective reel support 4, which is mounted on the supporting frame 2 and can rotate about a respective unreeling axis 100 of the reel 3.

[0024] The unreeling assembly 1 is moreover provided with a motorized traction drum 5, for example by means of a respective actuation motor 9, which is designed to unwind the continuous film 10 from the reel 3.

[0025] For keeping the tension of the continuous film 10 being unreeled from the reel 3 constant, at least one tensioning element 6 is provided between the reel 3 and the traction drum 5, which tensioning element is movable, with respect to the supporting frame 2, along a respective movement path 200.

[0026] According to the invention, the unreeling assembly 1 comprises means 20 for estimating the radius (r) of the reel 3 of continuous film 10 being unreeled as a function of the data related to the angular velocity (ω) of the reel 3, to the speed (v) of the film drawn by the traction drum (5) and to the position (φ) of the tensioning element 6 with respect to the supporting frame 2 along the respective movement path 200.

[0027] In particular, the estimation means 20 acquire, for example by means of respective encoders, and calculate the aforementioned data substantially instantaneously where the term instantaneously is used to mean that the acquisition and/or calculation times (for example in the order of a few milliseconds) are negligible in the context of the timing that characterizes the process.

[0028] According to a preferred embodiment, the estimation means 20 comprise a "state observer", i.e. a system of differential equations that estimates the evolution over time of an observable variable, specifically, of the radius (r) of the reel being unreeled.

[0029] With specific reference to the embodiment

shown in Figure 2, if the reel 3 is supported by a reel support 4 which is associated with a respective servomotor 13, then the (instantaneous) value of the angular velocity (ω) of the reel support 4 is already available since this data item is set directly by control means 22, which are designed to control the angular velocity (ω) of the reel 3 in order to keep the tensioning element 6 in a pre-determined position.

[0030] The values of the speed (v) of the traction drum 5 and of the position (φ) of the tensioning element 6 with respect to the supporting frame 2 along the respective movement path 200 are instead acquired by acquisition means 11.

[0031] With reference to the embodiment shown in Figure 3, the "state observer" 21 can be adapted to acquire the data item related to the speed (v) of the film drawn by the traction drum 5 from a control device, indicated with the numeral 23, which is adapted to control a motor 9 for actuating the traction drum 5, whereas the values related to the angular velocity (ω) of the reel 3 and to the position (φ) of the tensioning element 6 are acquired by the acquisition means 11.

[0032] According to a preferred embodiment which is shown schematically in Figure 4, it is possible for the estimation means 20 to comprise:

- acquisition means 11 which are designed to acquire the data item related to the position (φ) of the tensioning element 6 with respect to the supporting frame 2 along the respective movement path 200;
- control means 22 which are designed to control the angular velocity (ω) of the reel 3 (by acting on a respective servomotor 13) and adapted to send the data item related to the aforementioned angular velocity (ω) to the state observer 21;
- a control device 23, which is associated with an actuation motor 9, designed to control the speed (v) of the traction drum 5 and adapted to send the data item related to the aforementioned speed (v) to the state observer 21.

[0033] According to a further embodiment shown in Figure 1, the estimation means 20 comprise data acquisition means 11 which are adapted to acquire the angular velocity (ω) of the reel 3 of continuous film 10 being unreeled and the speed (v) of the film drawn by the traction drum 5 by means of, for example, respective encoders and the position (φ) of the tensioning element 6 with respect to the supporting frame 2 along the respective movement path 200 for example by means of a potentiometer.

[0034] These data acquisition means 11 are associated with a "state observer" 21 which is designed to perform the estimation of the radius (r) of the reel 3 being unreeled.

[0035] There is nothing to prevent the control device 23, the control means 22, the acquisition means 11 and the state observer 21 from being all integrated, or being

only partly integrated, in the same processor or in different processors.

[0036] With reference to the embodiment shown schematically in the figures, downstream of the traction drum 5 there is an applicator 30 for applying labels which are made from the continuous film 10 onto containers to be labeled.

[0037] In order to optimize the unwinding of the continuous film 10 from the reel 3, the supporting frame 2 supports, between the reel 3 of continuous film 10 being unreeled and the traction drum 5, a plurality of return rolls 7.

[0038] Advantageously, the supporting frame 2 can support at least two reels; between these two reels and the tensioning element 6, there is a joining station 8 which is designed to provide the connection between the end portion of the continuous film 10 unreeled from the reel 3 about to be depleted and the end portion of the film supported by the other reel.

[0039] According to a preferred embodiment, the tensioning element 6 can be constituted by what is called a tensioning dandy roll 6a which is supported by the supporting frame 2 so that it can rotate about a respective pivoting axis 101.

[0040] In this specific case, the position (φ) of the tensioning element 6 with respect to the supporting frame 2 is constituted by the angular shift of the tensioning dandy roll 6a with respect to a predetermined base position, which is normally measured by means that are per se known such as, for example, an angular potentiometer.

[0041] The measurement of this data item is also normally performed in the unreeling assemblies 1 to make it possible to operate on the braking devices or on the servomotors associated with the reel supports 4 in order to keep the tension of the continuous film 10 being unreeled from the reel 3 constant.

[0042] According to a possible embodiment, the estimation means 20, and in particular the state observer 21, uses, in order to estimate the radius (r) of the reel 3 being unreeled, the following system of differential equations:

$$\dot{\hat{\varphi}} = k_1 (\omega \hat{r} - v) - k_2 (\hat{\varphi} - \varphi)$$

$$\dot{\hat{r}} = -k_3 \omega - k_1 k_4 \omega (\hat{\varphi} - \varphi)$$

where:

- k_1 is a constant that depends on the geometry of the unreeling assembly;
- k_2 is a constant that depends on the speed of the acquisition means 11 and of the calculation means 12;
- k_3 is an optional constant that depends on the thickness of the film;
- k_4 is a constant that depends on the electronic ad-

justments of the system;

- (v, ω, φ) are the measurements of the speed of the traction drum 5, of the angular velocity of the reel 3 and of the position of the tensioning element 6;
- ($\hat{\varphi}, \hat{r}$) are the estimates of the position of the tensioning element 6 with respect to the supporting frame 2 and of the radius (r) of the reel 3 being unreeled;
- ($\dot{\hat{\varphi}}, \dot{\hat{r}}$) are the derivatives of these estimates.

[0043] The present invention also provides a method for estimating the radius (r) of a reel 3 of continuous film 10 being unreeled as a result of the action of a motorized traction drum 5.

[0044] In particular, between the reel 3 and the traction drum 5 there is an element 6 for tensioning the continuous film 10 being unreeled.

[0045] In more detail, the method comprises a step of estimation, by estimation means (20), of the radius (r) of the reel (3) of continuous film (10) being unreeled as a function of the data related to the angular velocity (ω) of the reel (3) of continuous film (10) being unreeled, to the speed (v) of the continuous film (10) drawn on the traction drum (5) and to the position (φ) of the tensioning element (6) with respect to a supporting frame (2).

[0046] The operation of the unreeling assembly 1 according to the invention is evident from the foregoing description.

[0047] In particular, the estimation means (20) are capable of acquiring/calculating, instantaneously, the data related to the angular velocity (ω) of the reel 3 of continuous film 10 being unreeled, to the speed (v) of the continuous film 10 drawn by the traction drum 5 and to the position (φ) of the tensioning element 6.

[0048] These data are calculated, for example by means of the use of equations which are typically of the differential type, and, on the basis of the characteristics of the geometry of the dandy roll, the radius (r) of the reel 3 is estimated extremely precisely, and without the use of any sensor, so as to optimize the control of the reel 3 itself, thus keeping the tensioning dandy roll 6a, and more generally the tensioning element 6, in the desired position.

[0049] All the characteristics of the invention which are indicated above as advantageous, advisable or similar, may also be missing or be substituted by equivalent characteristics.

[0050] The individual characteristics set out with reference to general teachings or to specific embodiments may all be present in other embodiments or substitute characteristics in such embodiments.

[0051] In practice it has been found that in all the embodiments the invention is capable of fully achieving the set aim and objects.

[0052] In particular, it has been found that the unreeling assembly 1 is capable of estimating the radius (r) of the reel 3 very precisely and reliably without using any sensor, with an evident simplification of the unreeling assembly in terms of construction and with consequent reduc-

tion in costs.

[0053] Furthermore, it has been found that, using the estimation means 20 according to the invention, it is possible to identify very precisely, and without the use of sensors, the moment of depletion of the reel in order to stop the machine or, if there is an automatic joining station 8, in order to perform the connection.

[0054] Besides, by not using sensors and instead calculating data related to the unreeling of the continuous film 10 from the reel 3, the estimate of the radius (r) is substantially impervious to any ovalization phenomena of the reel 3 and, therefore, it prevents the possibility of underestimating the radius, such possibility being very frequent in the known unreeling assemblies.

[0055] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0056] In practice the materials used, provided they are compatible with the specific use, as well as the dimensions and the shapes may be as desired, according to the requirements.

[0057] Moreover, all the details may be substituted by other, technically equivalent elements.

[0058] The disclosures in Italian Patent Application No. VR2010A000003 from which this application claims priority are incorporated herein by reference.

[0059] Where the technical features mentioned in any claim are followed by reference numerals and/or signs, those reference numerals and/or signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference numerals and/or signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference numerals and/or signs.

Claims

1. An unreeling assembly (1), particularly for labeling devices, comprising a supporting frame (2) for at least one reel (3) of continuous film (10) which is supported by a respective reel support (4), which can rotate about an unreeling axis (100) of the reel (3), and a motorized traction drum (5), which is designed to unreel said continuous film (10) from said reel (3) of continuous film, between the reel (3) of continuous film (10) being unreeled and said traction drum (5) there being at least one element (6) for tensioning said continuous film (10), said tensioning element (6) being movable, with respect to said supporting frame (2), along a respective movement path (200), **characterized in that** it comprises means for estimating the radius (r) of said reel (3) of continuous film (10) as a function of the data related to the angular velocity (ω) of said reel (3), to the speed (v) of the film drawn by said traction drum (5) and to the position (φ) of said tensioning element (6) with respect to said supporting frame (2) along the respec-

tive movement path (200).

2. The unreeling assembly (1) according to claim 1, **characterized in that** said estimation means (20) comprise a "state observer" (21).
3. The unreeling assembly (1) according to one or more of the preceding claims, **characterized in that** said "state observer" (21) is adapted to acquire the data item related to the position (φ) of said tensioning element (6) with respect to said supporting frame (2) along the respective movement path (200) from acquisition means (11) which are associated with means for detecting the position of said tensioning element (6).
4. The unreeling assembly (1) according to one or more of the preceding claims, **characterized in that** said reel (3) is supported by a reel support (4), which is associated with a respective servomotor (13) adapted to actuate rotationally said reel (3) about the respective unreeling axis (100).
5. The unreeling assembly (1) according to one or more of the preceding claims, **characterized in that** said "state observer" (22) is adapted to acquire the data item related to the angular velocity (ω) of said reel (3) from control means (21) which are adapted to control the rotation rate of the respective servomotor (4).
6. The unreeling assembly (1) according to one or more of the preceding claims, **characterized in that** said "state observer" (22) is adapted to acquire the data item related to the speed (v) of the film drawn by said traction drum (5) from a control device (23) which is associated with a motor (9) for actuating said traction drum (5).
7. The unreeling assembly (1) according to one or more of the preceding claims, **characterized in that** said estimation means (20) comprise data acquisition means (11) adapted to acquire the angular velocity (ω) of the reel (3) of continuous film (10) being unreeled, the speed (v) of the film drawn by said traction cylinder (5), and the position (φ) of said tensioning element (6) with respect to said supporting frame (2), said acquisition means (11) being adapted to transfer said data to a "state observer" (22) for an estimation of the radius (r) of the reel (3) being unreeled.
8. The unreeling assembly (1) according to one or more of the preceding claims, **characterized in that** said "state observer" uses, in order to estimate the radius (r) of said reel (3) being unreeled, the following system of differential equations:

$$\dot{\hat{\varphi}} = k_1 (\omega \hat{r} - v) - k_2 (\hat{\varphi} - \varphi)$$

$$\dot{\hat{r}} = -k_3 \omega - k_1 k_4 \omega (\hat{\varphi} - \varphi)$$

where:

- (k_1, k_2, k_3, k_4) are constants which depend on the mechanical and electronic characteristics of said unreeling assembly (1);

- (v, ω, φ) are the measurements of the speed of said traction drum (5), of the angular velocity of said reel (3) being unreeled and of the position of said tensioning element (6);

- ($\hat{\varphi}, \hat{r}$) are the estimates of the position of said tensioning element (6) with respect to said supporting frame (2) and of the radius of the reel (3) being unreeled;

- ($\dot{\hat{\varphi}}, \dot{\hat{r}}$) are the derivatives of these estimates.

9. The unreeling assembly (1) according to one or more of the preceding claims, **characterized in that** it comprises, between at least two reels (3) and said tensioning element (6), a joining station (8) adapted to provide the connection between the end portion of the continuous film (10) unreeled from the reel (3) about to be depleted and the end portion of the film supported by the other reel.

10. The unreeling assembly (1) according to one or more of the preceding claims, **characterized in that** said tensioning element (6) comprises a tensioning dandy roll (6a), which is supported so that it can rotate by said supporting frame (2) about a respective pivoting axis (101).

11. A method for controlling the unreeling, by a motorized traction drum (5), of a continuous film (10) from a reel (3), between said reel (3) and said traction drum (5) there being an element (6) for tensioning the continuous film (10) being unreeled, said method being **characterized in that** it comprises a step of estimation, by estimation means (20), of the radius (r) of the reel (3) of continuous film (10) being unreeled as a function of the data related to the angular velocity (ω) of the reel (3) of continuous film (10) being unreeled, to the speed (v) of said continuous film (10) drawn by said traction drum (5), and to the position (φ) of said tensioning element (6) with respect to a supporting frame (2).

Patentansprüche

1. Eine Abspulanordnung (1), insbesondere für Etikettier-
vorrichtungen, die einen Stützrahmen (2) für min-

destens eine Spule (3) von durchgehendem Film (10) umfasst, die von einem dazugehörigen Spulenträger (4) getragen wird, welcher sich um eine Abspulachse (100) der Spule (3) drehen kann, und eine motorisierte Zugtrommel (5), die dazu ausgebildet ist, den durchgehenden Film (10) von der Spule (3) von durchgehendem Film abzuspielen, wobei sich zwischen der Spule (3) von durchgehendem Film (10), der abgespult wird, und der Zugtrommel (5) mindestens ein Element (6) zum Spannen des durchgehenden Films (10) befindet, wobei das Spannelement (6) im Verhältnis zu dem Stützrahmen (2) entlang einem entsprechenden Bewegungspfad (200) beweglich ist, **dadurch gekennzeichnet, dass** sie Mittel zur Schätzung des Radius (r) der Spule (3) von durchgehendem Film (10) als Funktion der Daten umfasst, die die Winkelgeschwindigkeit (ω) der Spule (3), die Geschwindigkeit (v) des Films, der von der Zugtrommel (5) gezogen wird, und die Position (φ) des Spannelements (6) im Verhältnis zu dem Stützrahmen (2) entlang dem entsprechenden Bewegungspfad (200) betreffen.

2. Die Abspulanordnung (1) gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Schätzmittel (20) einen "Zustandsbeobachter" (21) umfassen,

3. Die Abspulanordnung (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** der "Zustandsbeobachter" (21) ausgebildet ist, um das Datenelement, das die Position (φ) des Spannelements (6) im Verhältnis zu dem Stützrahmen (2) entlang dem entsprechenden Bewegungspfad (200) betrifft, von Erfassungsmitteln (11) zu erhalten, die mit Mitteln zur Erfassung der Position des Spannelements (6) verknüpft sind.

4. Die Abspulanordnung (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die Spule (3) von einem Spulenträger (4) getragen wird, der mit einem entsprechenden Servomotor (13) verknüpft ist, der ausgebildet ist, um die Spule (3) drehend um die entsprechende Abspulachse (100) anzutreiben.

5. Die Abspulanordnung (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** der "Zustandsbeobachter" (22) ausgebildet ist, um das Datenelement, das die Winkelgeschwindigkeit (ω) der Spule (3) betrifft, von Steuerungsmitteln (21) zu erhalten, die ausgebildet sind, um die Rotationsgeschwindigkeit des entsprechenden Servomotors (4) zu steuern.

6. Die Abspulanordnung (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** der "Zustandsbeobachter" (22) ausgebildet ist, um das Datenelement, das die Ge-

schwindigkeit (v) des Films betrifft, der von der Zugtrommel (5) gezogen wird, von einer Steuerungsvorrichtung (23) zu erhalten, die mit einem Motor (9) für den Antrieb der Zugtrommel (5) verknüpft ist.

7. Die Abspulanordnung (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die Schätzmittel (20) Datenerfassungsmittel (11) umfassen, die geeignet sind, Folgendes zu erfassen: die Winkelgeschwindigkeit (ω) der Spule (3) von durchgehendem Film (10), der abgespult wird, die Geschwindigkeit (v) des Films, der von der Zugtrommel (5) gezogen wird, und die Position (φ) des Spannelements (6) im Verhältnis zu dem Stützrahmen (2), wobei die Erfassungsmittel (11) ausgebildet sind, um die Daten zur Schätzung des Radius (r) der Spule (3), die abgewickelt wird, an einen "Zustandsbeobachter" (22) zu übertragen.
8. Die Abspulanordnung (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** der "Zustandsbeobachter" zur Schätzung des Radius (r) der Spule (3), die abgewickelt wird, folgendes System von Differentialgleichungen nutzt:

$$\dot{\hat{\varphi}} = k_1 (\omega \hat{r} - v) - k_2 (\hat{\varphi} - \varphi)$$

$$\dot{\hat{r}} = -k_3 \omega - k_4 k_1 \omega (\hat{\varphi} - \varphi)$$

worin:

- (k_1 , k_2 , k_3 , k_4) Konstanten sind, die von den mechanischen und elektronischen Eigenschaften der Abspulanordnung (1) abhängen;
 - (v , ω , φ) die Messungen der Geschwindigkeit der Zugtrommel (5), der Winkelgeschwindigkeit der Spule (3), die abgewickelt wird, und der Position des Spannelements (6) sind;
 - ($\hat{\varphi}$, $\hat{r}$) die Schätzungen der Position des Spannelements (6) im Verhältnis zu dem Stützrahmen (2) und des Radius der Spule (3) sind, die abgewickelt wird;
 - ($\dot{\hat{\varphi}}$, $\dot{\hat{r}}$) die Ableitungen dieser Schätzungen sind.
9. Die Abspulanordnung (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie zwischen mindestens zwei Spulen (3) und dem Spannelement (6) eine Verbindungsstation (8) umfasst, die ausgebildet ist, um die Verbindung zwischen dem Endabschnitt des durchgehenden Films (10), der von der nahezu verbrauchten Spule (3) abgewickelt wird, und dem En-

dabschnitt des Films, der von der anderen Spule getragen wird, herzustellen.

10. Die Abspulanordnung (1) gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** das Spannelement (6) einen Spanndandyroller (6a) umfasst, der derart getragen wird, dass er sich durch den Stützrahmen (2) um eine entsprechende Schwenkachse (101) drehen kann.
11. Ein Verfahren zum Steuern des Abwickelns, durch eine motorisierte Zugtrommel (5), eines durchgehenden Films (10) von einer Spule (3), wobei sich zwischen der Spule (3) und der Zugtrommel (5) ein Element (6) zum Spannen des durchgehenden Films (10) befindet, der abgewickelt wird, wobei das Verfahren **dadurch gekennzeichnet ist, dass** es einen Schritt der Schätzung, durch Schätzungsmittel (20), des Radius (r) der Spule (3) von durchgehendem Film (10), der abgewickelt wird, als Funktion der Daten umfasst, die Folgendes betreffen: die Winkelgeschwindigkeit (ω) der Spule (3) von durchgehendem Film (10), der abgespult wird, die Geschwindigkeit (v) des durchgehenden Films (10), der von der Zugtrommel (5) gezogen wird, und die Position (φ) des Spannelements (6) im Verhältnis zu einem Stützrahmen (2).

30 Revendications

1. Ensemble de dévidage (1), plus particulièrement pour des dispositifs d'étiquetage, comprenant un châssis de support (2) pour au moins une bobine (3) de film continu (10), qui est supportée par un support de bobine (4) correspondant, qui peut tourner autour d'un axe de dévidage (100) de la bobine (3), et un tambour de traction motorisé (5), qui est conçu pour dérouler ledit film continu (10) de ladite bobine (3) de film continu, au moins un élément (6) pour la tension dudit film continu (10), se trouvant entre la bobine (3) de film continu (10) déroulé et le tambour de traction motorisé (5), ledit élément de tension (6) étant mobile par rapport audit châssis de support (2) le long d'une trajectoire (200) correspondante, **caractérisé en ce qu'il** comprend des moyens pour estimer le rayon (r) de ladite bobine (3) de film continu (10) en fonction des données relatives à la vitesse angulaire (ω) de ladite bobine (3), à la vitesse (v) du film tiré par ledit tambour de traction (5) et à la position (φ) dudit élément de tension (6) par rapport audit châssis de support (2) le long de la trajectoire (200) correspondante.
2. Ensemble de dévidage (1) selon la revendication 1, **caractérisé en ce que** lesdits moyens d'estimation (20) comprennent un « observateur d'état » (21).

3. Ensemble de dévidage (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit « observateur d'état » (21) est conçu pour acquérir les données relatives à la position (φ) dudit élément de tension (6) par rapport audit châssis de support (2) le long de la trajectoire (200) correspondante à partir de moyens d'acquisition (11) qui sont associés avec des moyens pour la détection de la position dudit élément de tension (6).
4. Ensemble de dévidage (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** ladite bobine (3) est supportée par un support de bobine (4), qui est associé avec un servomoteur (13) correspondant conçu pour actionner en rotation ladite bobine (3) autour de l'axe de dévidage (100) correspondant.
5. Ensemble de dévidage (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit « observateur d'état » (22) est conçu pour acquérir les données relatives à la vitesse angulaire (ω) de ladite bobine (3) à partir de moyens de contrôle (21) qui sont conçus pour contrôler le taux de rotation du servomoteur (4) correspondant.
6. Ensemble de dévidage (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit « observateur d'état » (22) est conçu pour acquérir les données relatives à la vitesse (v) du film tiré par ledit tambour de traction (5) à partir d'un dispositif de contrôle (23) qui est associé à un moteur (9) pour l'actionnement dudit tambour de traction (5).
7. Ensemble de dévidage (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** lesdits moyens d'estimation (20) comprennent des moyens d'acquisition de données (11) conçus pour acquérir la vitesse angulaire (ω) de la bobine (3) de film continu (10) dévidée, la vitesse (v) du film tiré par ledit cylindre de traction (5) et la position (φ) dudit élément de tension (6) par rapport audit châssis de support (2), lesdits moyens d'acquisition (11) étant conçus pour transférer lesdites données à un « observateur d'état » (22) pour une estimation du rayon (r) de la bobine (3) dévidée,
8. Ensemble de dévidage (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit « observateur d'état » utilise, afin d'estimer le rayon (r) de ladite bobine (3) dévidée, le système suivant d'équations différentielles :

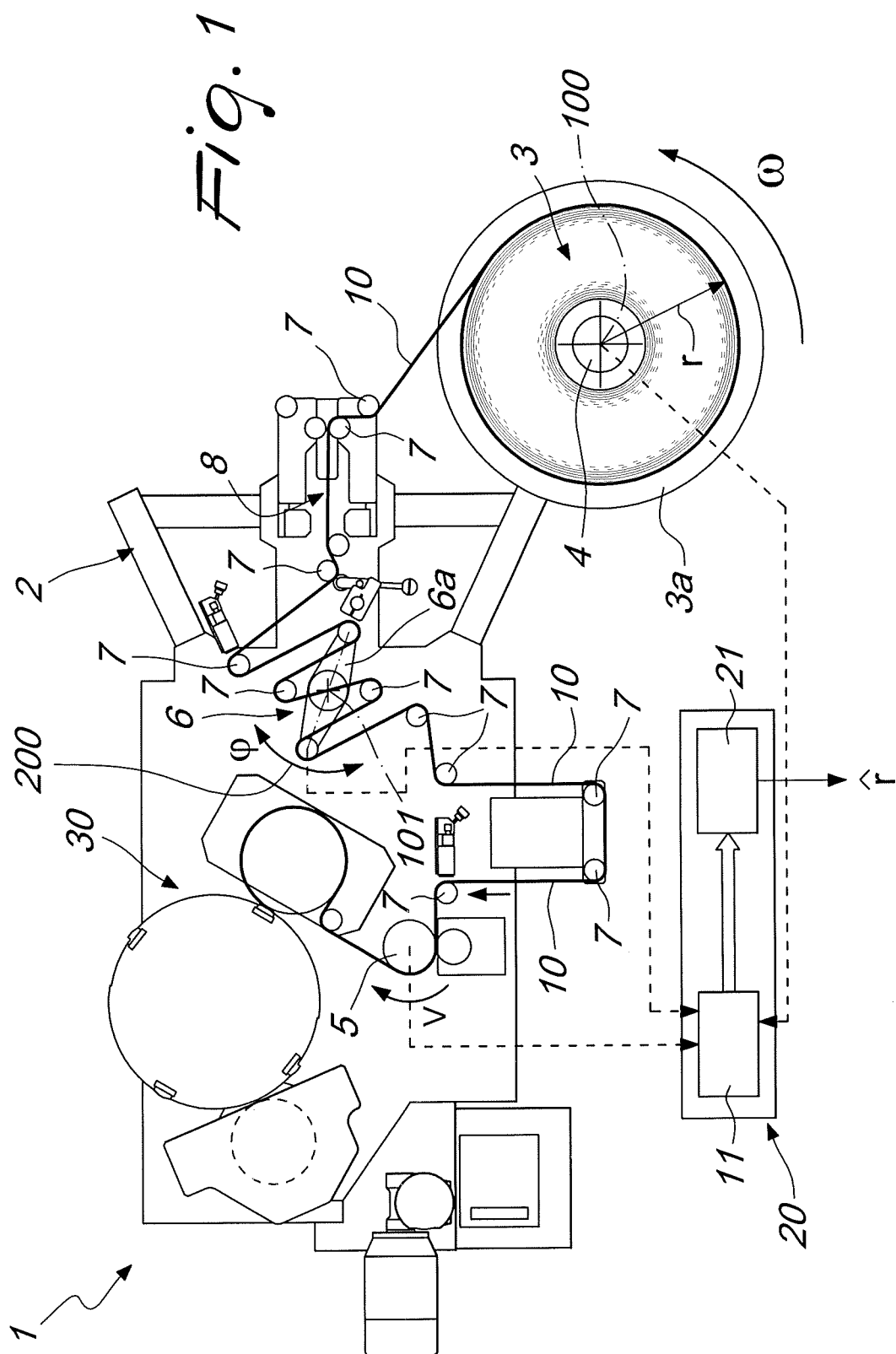
$$\dot{\hat{\varphi}} = k_1 (\omega \hat{r} - v) - k_2 (\hat{\varphi} - \varphi) \quad 55$$

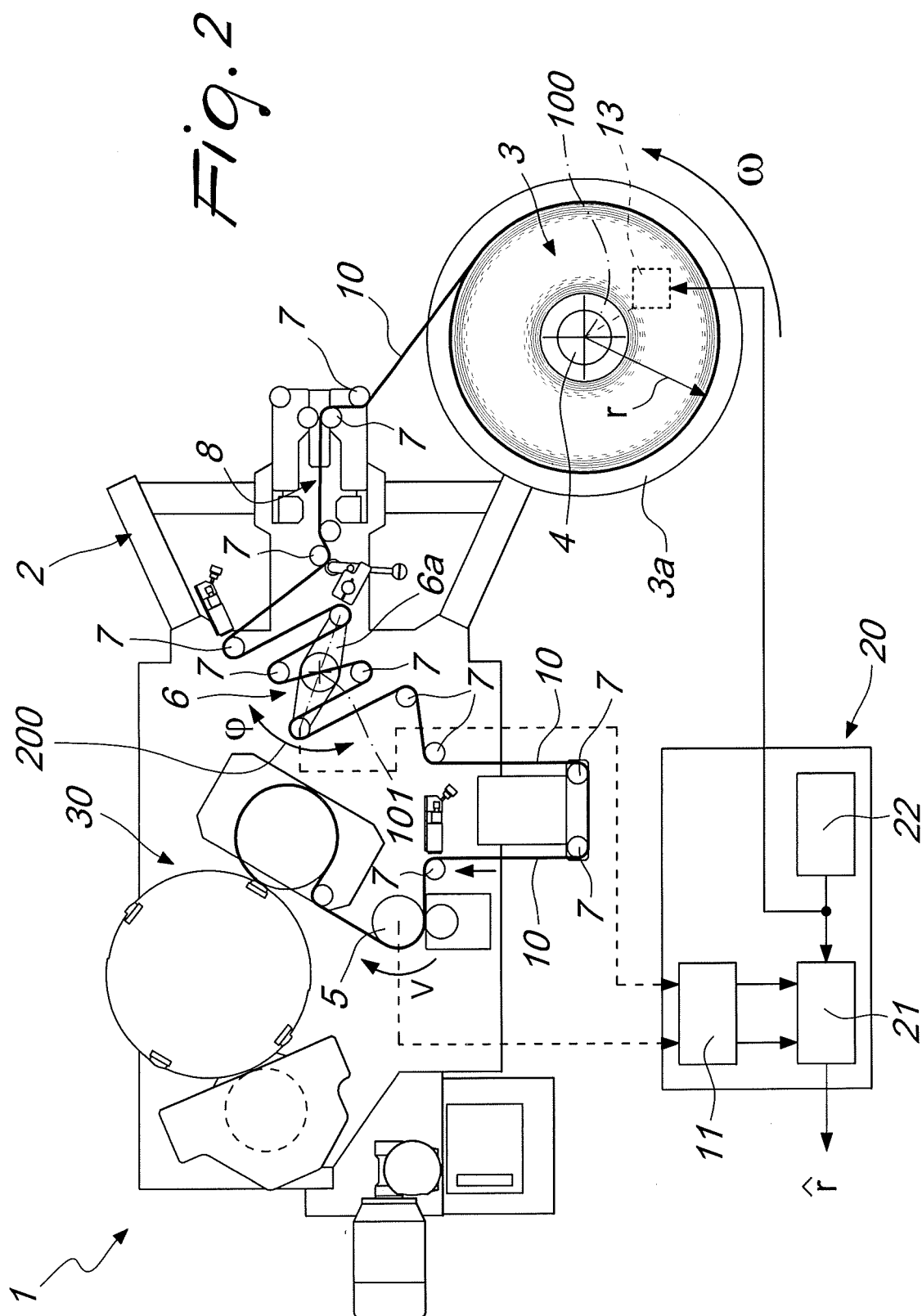
$$\dot{\hat{r}} = -k_3 \omega - k_1 k_4 \omega (\hat{\varphi} - \varphi)$$

dans lesquelles :

- (k_1, k_2, k_3, k_4) sont des constantes qui dépendent des caractéristiques mécaniques et électroniques dudit ensemble de dévidage (1) ;
- (v, ω, φ) sont les mesures de la vitesse dudit tambour de traction (5), de la vitesse angulaire de ladite bobine (3) dévidée et de la position dudit élément de tension (6) ;
- ($\hat{\varphi}, \hat{r}$) sont les estimations de la position dudit élément de tension (6) par rapport audit châssis de support (2) et du rayon de la bobine (3) dévidée ; ($\dot{\hat{\varphi}}, \dot{\hat{r}}$) sont les dérivées de ces estimations.

9. Ensemble de dévidage (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce qu'il** comprend, entre au moins deux bobines (3) et ledit élément de tension (6), un poste de jonction (8) conçu pour établir la connexion entre la portion d'extrémité du film continu (10) dévidé de la bobine (3) sur le point d'être épuisé et la portion d'extrémité du film supporté par l'autre bobine.
10. Ensemble de dévidage (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit élément de tension (6) comprend un rouleau égoutteur de tension (6a) qui est supporté de façon à pouvoir tourner, par l'intermédiaire dudit châssis de support (2), autour d'un axe de pivotement (101) correspondant.
11. Procédé de contrôle du dévidage, par un tambour de traction motorisé (5), d'un film continu (10) à partir d'une bobine (3), un élément (6) pour la tension du film continu (10) dévidé se trouvant entre ladite bobine (3) et ledit tambour de traction (5), ledit procédé étant **caractérisé en ce qu'il** comprend une étape d'estimation, par des moyens d'estimation (20) du rayon (r) de la bobine (3) de film continu (10) dévidé en fonction des données relatives à la vitesse angulaire (ω) de la bobine (3) de film continu (10) dévidé, à la vitesse (v) dudit film continu (10) tiré par ledit tambour de traction (5) et à la position (φ) dudit élément de tension (6) par rapport à un châssis de support (2).





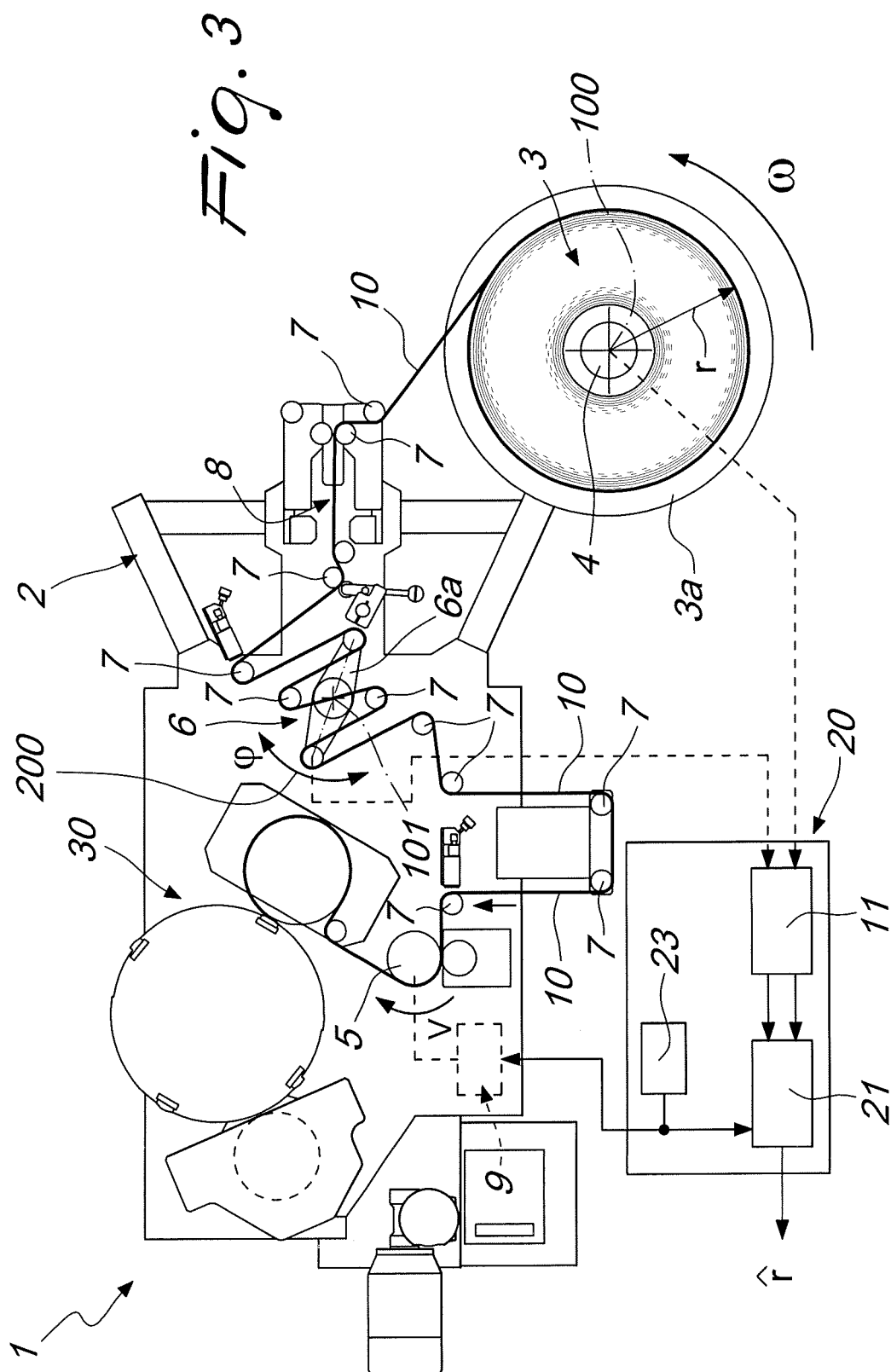
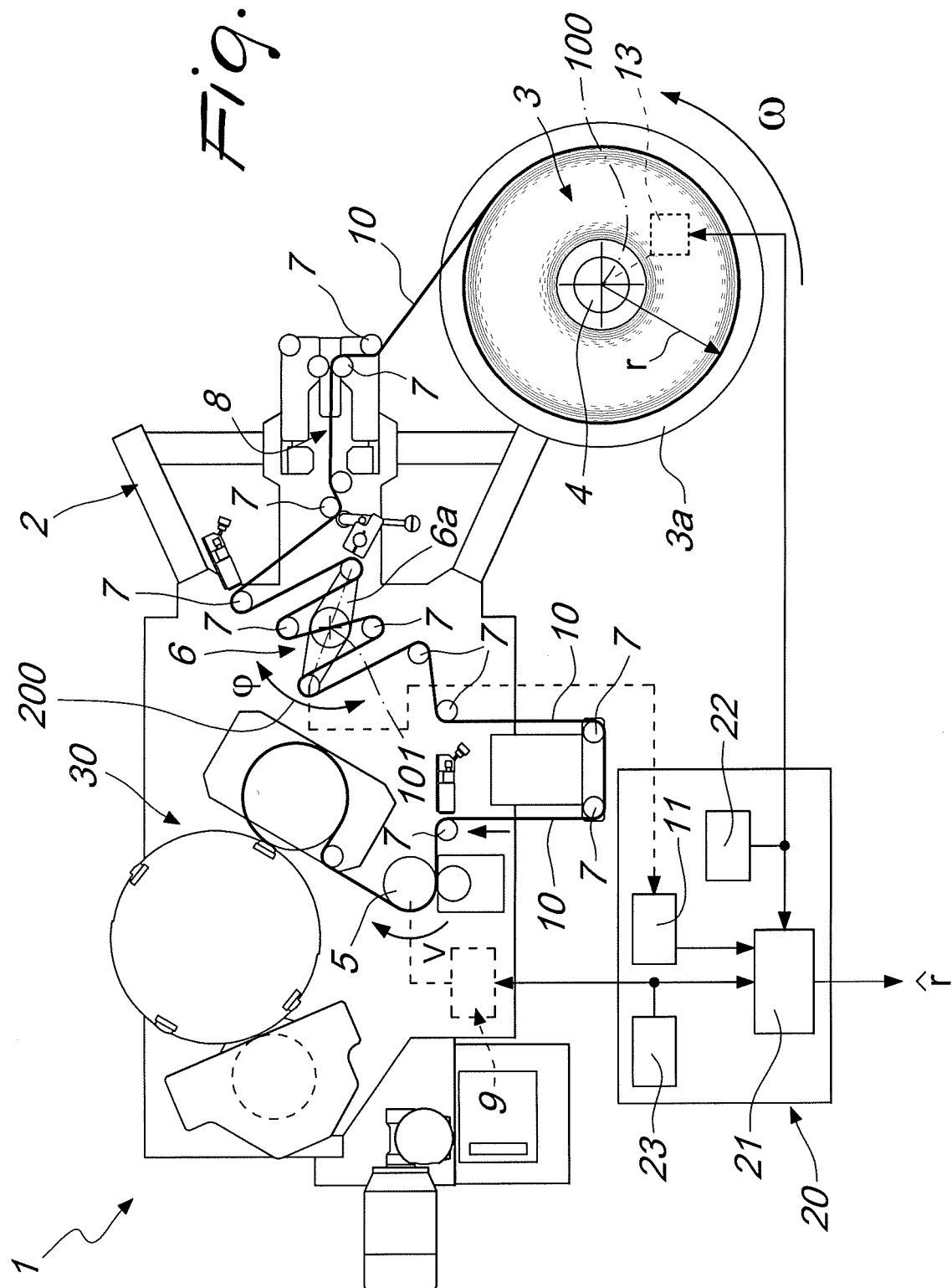


Fig. 4



REFERENCES CITED IN THE DESCRIPTION

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