

EUROPEAN PATENT APPLICATION

Application number: **90109328.6**

Int. Cl.⁵: **B65H 18/26, B65H 18/16**

Date of filing: **17.05.90**

Priority: **23.05.89 IT 2059989**

Date of publication of application:
28.11.90 Bulletin 90/48

Designated Contracting States:
BE CH DE ES FR GB LI NL

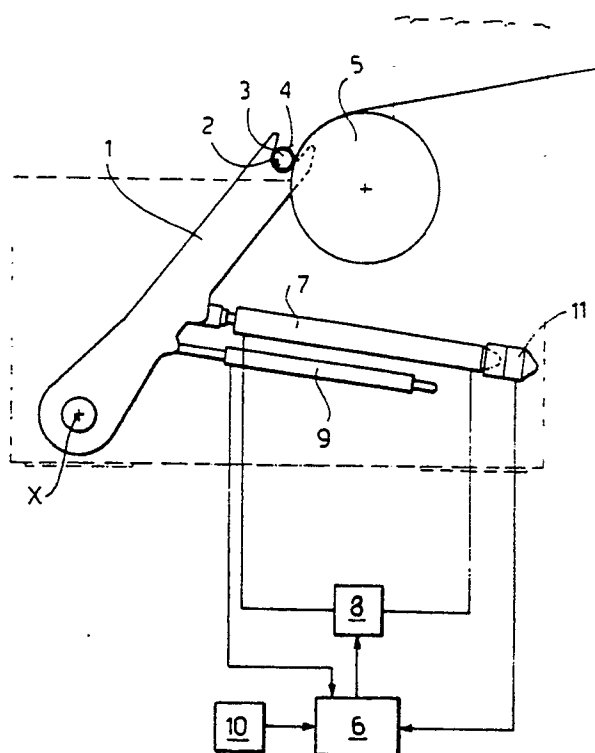
Applicant: **ING. L. DOLCI S.P.A.**
Via Zucchi, 18
I-20095 Cusano Milanino(IT)

Inventor: **Giampaolo, Spanio**
Via Ardigò, 21
Monza, Milan(IT)
Inventor: **Vinicio, Mauri**
Via Repubblica 43
Cologno Monzese, Milan(IT)

Representative: **Dr. Ing. A. Racheli & C.**
Viale San Michele del Carso, 4
I-20144 Milano(IT)

Apparatus for winding webs of material.

An apparatus, comprising two parallel connecting rods (1) oscillating around a lower horizontal axis (X) and each having a fork (2) at the upper end to accommodate the mandrel (3) of a coil (4) constantly pressed peripherally against a winding roller (5), and a device to regulate the nip pressure between the coil (4) and the winding roller (5), comprising a control unit (6), which processes, according to a pre-determined algorithm, the signals coming from a linear potentiometer (9) that measures the movements of the connecting rods (1) with respect to a reference position, to obtain signals indicative of the actual weight of the coil, which are used to control a hydraulic actuator (7) that regulates the pressure of the connecting rods (1).



APPARATUS FOR WINDING WEBS OF MATERIAL

The present invention relates to an apparatus for winding material in webs, notably plastic films.

An apparatus of this type normally comprises two parallel connecting rods, oscillating around a common horizontal axis, disposed at their lower ends, each with a forked upper end designed to accommodate the ends of a mandrel around which the web-coil is wound. During winding, the coil is pressed against a motorized winding roller which feeds the web.

In order to obtain uniform winding of the coil, the nip pressure between the coil and the winding roller must be as constant as possible. Obviously the nip pressure varies with the diameter of the coil being wound, mainly due to the increase in weight force of the coil.

Regulating devices have therefore been proposed to compensate for the changes in nip pressure. This is done by sensors which directly, or indirectly, measure the actual nip pressure and transmit signals to a control unit that brings the nip pressure back to the set value, controlling the actuators of the oscillating connecting rods, normally consisting of piston-cylinder assemblies.

Known devices of the above type are not without drawbacks.

Thus, for example, load sensors intended exclusively for direct measurement of the nip pressure, being mounted on the winding roller, are affected by the vibrations of the winding roller, accentuated by the possible presence of the kinematic motion for automatic coil changing and by the geometrical irregularity of the coil itself. Therefore, the signals transmitted to the control unit may be inaccurate, causing incorrect adjustment of the nip pressure.

Load sensors for indirect measurement of the nip pressure are normally placed at the forked ends of the connecting rods, i.e. on the supports for the coil and measure a component of the weight force of the coil. Load sensors thus positioned are easily damaged if the coils are not handled with care when they are being introduced or discharged.

The aim of the invention is to overcome the above problems, by proposing a nip pressure regulating device that is extremely simple and far more reliable than those of known design.

This aim is achieved, according to the invention, by an apparatus with the features listed in the characterizing part of independent claim 1.

According to the invention, therefore, the actual nip pressure between the coil and the winding roller is determined according to the instantaneous positions of a linear detector connected to the

connecting rods, by means of an algorithm entered into a control unit which controls, by means of a proportional hydraulic valve, at least one actuator, preferably a hydraulic piston, for operation of the connecting rods, to correct the nip pressure and maintain it at the predetermined constant value.

The linear detector is preferably a linear potentiometer and the nip pressure is determined on the basis of the weight of the coil being wound.

Obviously the algorithm entered into the control or processing unit to determine the weight of the coil on the basis of the position of the linear potentiometer takes into account the whole geometry of the system and a programming unit is provided to modify the parameters entered into the control unit.

According to the invention, the weight of the coil, and therefore the nip force, is essentially determined on the basis of measurement of a linear displacement, which means that the apparatus according to the invention is extremely simple and reliable.

The linear potentiometer can be integrated with the hydraulic connecting rod actuator, further simplifying the mechanics of the device and reducing its cost.

The regulating ring can be closed by placing a load cell on the connecting rod actuator support, to directly measure the actual correction force exerted by the actuator and compare it with the force value transmitted to it by the control unit.

Further characteristics of the invention will be clear from the detailed description that follows, related to an exemplary embodiment, with reference to the single figure attached, which shows a diagrammatic side elevation of a device for winding webs of material, provided with nip pressure regulating means according to the invention.

With reference to this figure, a device for winding webs of material, notably plastic films, of the type to which the invention refers, comprises two parallel connecting rods 1, only one of which can be seen in the figure, the other being hidden behind the first. The connecting rods 1 oscillate around a lower horizontal axis X and have at their upper ends a fork 2, providing a seat for a respective end of a mandrel 3, on which is formed a coil 4, shown at the start of the winding phase in the attached figure. In order to wind the web of material, a motorized winding roller 5 is provided, against the outer surface of which the coil 4 is constantly pressed. The axes of the coil 4 and the winding roller 5 are parallel to the oscillation axis X of the connecting rods 1.

To maintain a constant nip pressure between the coil 4 and the winding roller 5, a control or

processing unit 6 is provided to control a hydraulic actuator 7, notably a piston-cylinder assembly, which actuates connecting rod 1 to compensate for the variations in nip pressure between the coil 4 and the winding roller 5.

According to the invention, the input to the control unit is a signal generated by a linear potentiometer 9 which measures the movements of the connecting rod 1 with respect to a reference position corresponding, for example, to the starting position for winding of the coil 4.

The linear potentiometer 9 has been illustrated as a separate unit in the attached figure, but it could be integrated with the hydraulic actuator 7.

The signals from the linear potentiometer 9 are processed in the control unit 6 on the basis of a predetermined algorithm, which takes into account the geometry of the system, so as to determine the actual weight of the coil 4 and thus the nip pressure between the coil 4 and the winding roller 5. On the basis of the information received, the control unit 6 transmits signals to a proportional hydraulic valve 8, which consequently drives the hydraulic actuator 7 that operates the connecting rod 1.

A programming unit 10 is provided for modification of the parameters entered into the control unit 6, for example the nip pressure between the coil 4 and the winding roller 5, the system geometry, the width and characteristics of the material being wound.

The regulation ring can be closed by providing a load cell 11 on the support of the hydraulic actuator 7 and providing feedback to the control unit 6. In the control unit 6 the correction force transmitted to the actuator 7 through the proportional valve 8 is constantly compared with the actual correction force exerted by the actuator 7, measured by the load cell 11.

Claims

1. An apparatus for winding webs of material, notably plastic films, comprising two parallel connecting rods oscillating around a lower horizontal axis (X) and each having a fork (2) at the upper end to accommodate the mandrel (3) of a coil (4) which is constantly pressed peripherally against the winding roller (5), and also comprising a regulating device to maintain said nip pressure constant, consisting of a control unit (6) which controls at least one actuator (7) acting on the connecting rods (1), characterized in that provision is made for at least one linear detector (9) connected to the connecting rods (1) to measure their displacement with respect to a reference position and transmit input signals to a control unit (6), where they are processed on the

basis of a predetermined algorithm, to obtain the actual nip pressure.

2. An apparatus according to claim 1, characterized in that in the control unit (6) the actual nip pressure is determined on the basis of the weight of the coil (4) being wound.

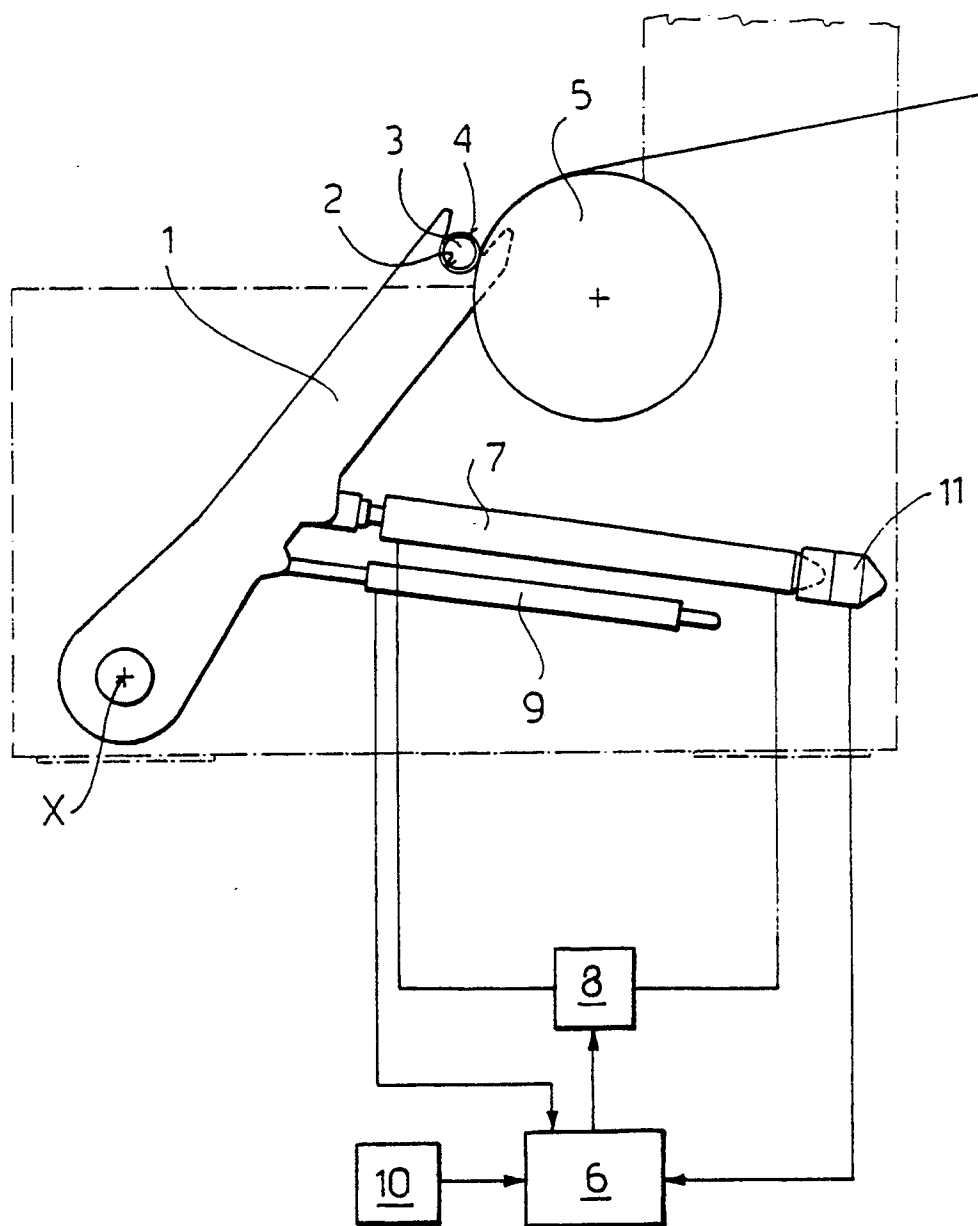
3. An apparatus according to claim 1 or 2, characterized in that said linear detector (9) is a linear potentiometer.

4. An apparatus according to claim 3, characterized in that said linear potentiometer (9) is integrated with the regulation actuator (7) of the connecting rods.

5. An apparatus according to any one of claims 1 to 4, wherein said regulation actuator (7) is a piston-cylinder assembly and is driven by the control unit (6) by means of a proportional hydraulic valve (8).

6. An apparatus according to any one of claims 1 to 5, characterized in that provision is made for a programming unit (10), particularly for modification of the parameters entered into the control unit (6).

7. An apparatus according to any one of claims 1 to 6, characterized in that provision is made for the ring of the regulation actuator (7) to be closed by placing a load cell (11) on the actuator support and providing feedback to the control unit (6)





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 10 9328

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DE-A-3 736 696 (WINDMÖLLER & HÖLSCHER) * figures; column 3, line 14 - column 4, line 17 * ---	1,2,5,6	B 65 H 18/26 B 65 H 18/16
A	GB-A-2 147 279 (REIFENHAUSER) * figure; page 1, line 112 - page 2, line 21 * ---	1,2,5	
A	DE-A-2 541 945 (H.I.E. KATAOKA) * figures 5-7,10; page 16, line 3 - page 19, line 26 * ---	1,5	
A	PATENT ABSTRACTS OF JAPAN vol. 10, no. 360 (M-541)(2417), 3 December 1986; & JP - A - 61 155147 (KATAOKA) 14.07.1986 -----	1,7	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 65 H
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 24-08-1990	Examiner FUCHS H. X. J.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			