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[33] **Denmark**
[31] **5582/67**

[54] **METHOD AND ARRANGEMENT FOR WINDING UP A CONTINUOUS WEB**
9 Claims, 6 Drawing Figs.

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[51] **Int. Cl.** **B65h 19/20**
[50] **Field of Search** 242/56, 56.1, 56.2, 58.2, 67.1, 67.2, 67.3, 68.1, 68.2, 72, 72.1

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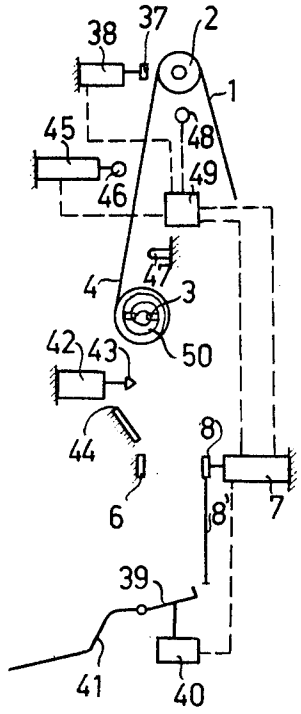
ABSTRACT: A method of winding a continuous web to form wound packages comprises the following steps: Winding on a run of the web to a winding element thus forming a wound package; removing said winding element from said wound package; moving away said wound package; holding fast said web at a holding point between said winding element and said wound package; bringing said winding element again into engagement with said web and beginning a new winding operation for only a few revolutions; cutting through said web between said winding element and said holding point; finishing said new winding operation. An apparatus for carrying out said method comprises a winding element consisting of two rotating grippers which can be moved in axial direction, a holding device for holding fast said web arranged below said winding element, and a cutting device arranged between said winding element and said holding device.



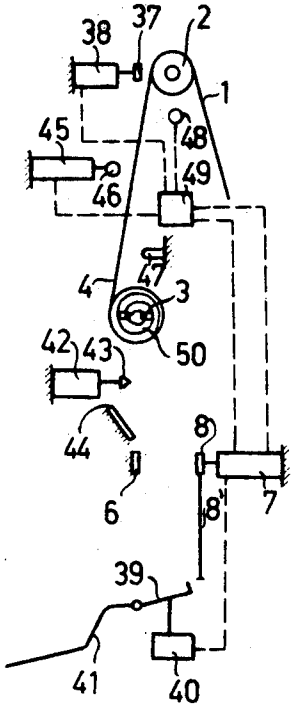


Fig.1

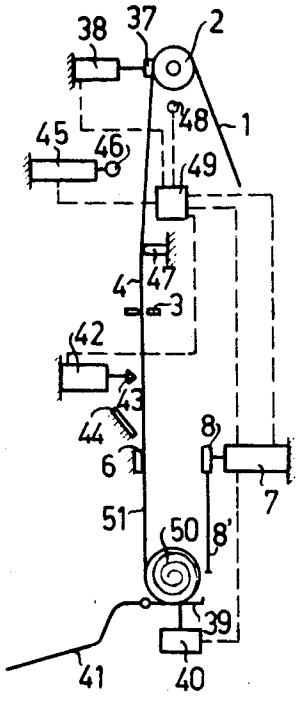


Fig.2

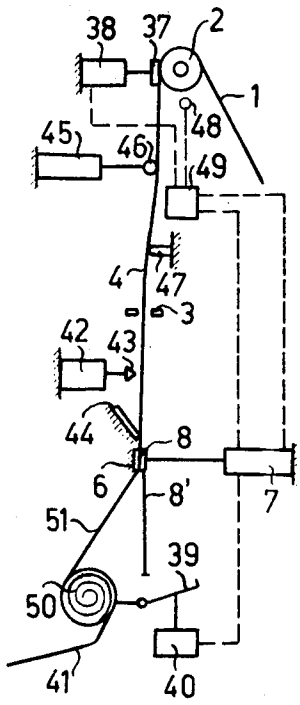
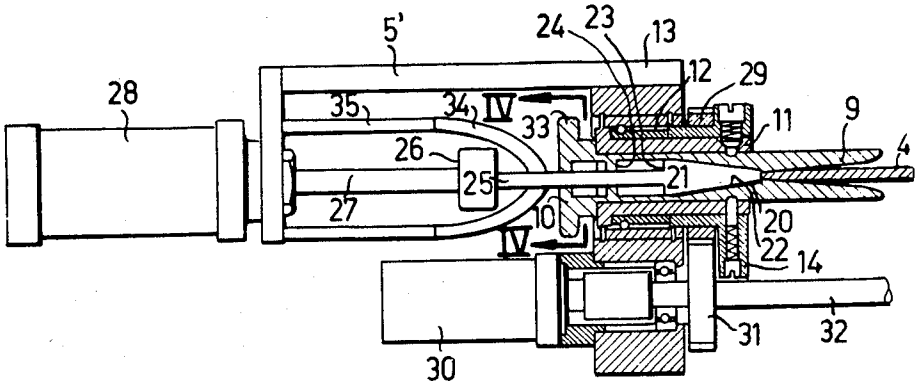


Fig.3

Fig. 4



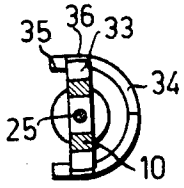


Fig. 5

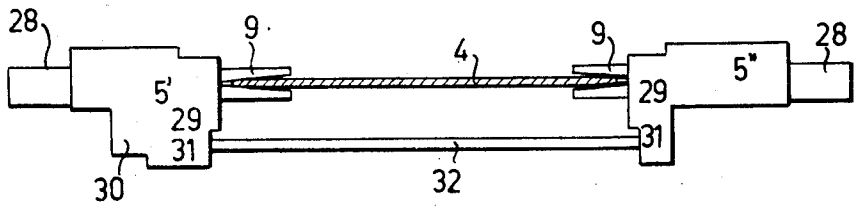


Fig. 6

METHOD AND ARRANGEMENT FOR WINDING UP A CONTINUOUS WEB

BACKGROUND OF THE INVENTION

In known methods and arrangements for winding a continuous web of material e.g. a web of plastics material film, to form wound packages, each of which has a predetermined web length, manual interventions are necessary.

SUMMARY OF THE INVENTION

It is the object of the present invention to provide a method of winding a continuous web to form wound packages each of which has a predetermined web length, with which it is possible to dispense with the manual interventions which have hitherto been necessary.

The method according to the invention consists in that a web run is wound on to a winding element, that the winding element is then removed from the wound package so that the latter is released, whereupon the wound package is moved away from the winding element, and then the web of material is held fast at a holding point between the winding element and the wound package, and subsequently the winding element is brought into engagement again with the material web and a new winding operation is begun before the web of material is severed at a point between the winding element and the holding point.

The invention also concerns an apparatus for carrying out the method according to the invention, in which according to the invention a winding element is provided with two coaxial, rotating grippers which are mobile in axial direction and also a holding device for holding the web of material securely, the said device, seen in the direction of movement of the web of material, being arranged downstream of the winding element.

BRIEF DESCRIPTION OF THE DRAWING

One embodiment example of an apparatus for carrying out the method according to the invention is represented in simplified form in the drawing, in which:

FIGS. **1**, **2** and **3** each show a diagrammatic view of an apparatus in the axial direction of the winding element in various phases of the working cycle respectively,

FIG. **4** is a fragmentary plan view on to a winding element on a greatly enlarged scale,

FIG. **5** shows a section taken in the line IV–IV of FIG. **4**, and

FIG. **6** shows a plan view on to a winding element.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIGS. **1** to **3**, **1** designates a continuous web of plastics material film which can consist for example of bags which are separated from one another by transverse welds and transversely disposed perforations, and it is assumed that this web of material is supplied from a welding and perforating machine, by a feed roller or from some other place. The web of material is conducted over a freely rotating guide roller **2** downwards to a winding element **3** and between the guide roller **2** and the winding element **3** is designated as **4**.

The winding element **3** comprises two coaxial rotating grippers **5'**, **5''** which are mobile in axial direction, and a holding device is provided having a fixed, bar-shaped block **6** and a bar-shaped block **8** which is adapted to be moved towards the first-mentioned block by means of a servomotor **7**, the said device being arranged downstream of the winding element **3** as viewed in the direction of travel of the web of material.

One of the grippers **5'** is shown in FIG. **4** and both grippers **5'**, **5''** in FIG. **6**. The two grippers are of identical construction, likewise the devices for moving them in the axial sense. On the other hand, the two grippers have a joint device for moving them in rotary movement. The gripper **5'** in FIG. **4** has two resiliently constructed fingers **9** which are arranged on a base member **10**. The base member **10** is arranged at that side of the fingers **9** which is remote from the web of material **4**, the said fingers being slightly spread in the direction towards the gripper **5''**, and receiving an edge zone of the web of material **4** between them. The base member **10** is arranged to be axially displaceable in a sleeve **11**. It comprises a prismatic cross section, and the sleeve opening receiving the base member is correspondingly prismatic in configuration, so that the base member is fast in rotation in the peripheral direction relatively to the sleeve. The sleeve **11** is mounted to be axially secure and rotationally mobile by means of a ball bearing **12** in a fixed frame **13**. The sleeve **11** has snap elements **14** by means of which the base member **10** and the fingers **9** are held fast in the axial end position in which the fingers are in engagement with the web of material **4**.

The fingers **9** comprise in a central region surfaces **20** which are arranged opposite one another and converge towards the web of material **4**, and thus bound a wedge-shaped chamber. In this chamber there is arranged a wedge **21** directed with its point towards the web of material, and with its side surfaces **22** abutting on the surfaces **20** of the fingers **9** in the operating position shown in FIG. **4**, the fingers being held in a specific spread position. The base surface of the wedge is constructed as an abutment **23** which cooperates with an abutment **24** of the base member arranged at a certain distance in the direction away from the web of material **4**. The wedge is connected to a rod **25** which at its other end has a rotationally mobile and axially immobile coupling **26**. The other half of this coupling is connected to a piston rod **27** of a servomotor **28** by means of which the fingers **9** can be moved in the axial sense. As shown diagrammatically in FIG. **6**, the gripper **5''** has an identical device for moving its fingers in the axial direction.

On the sleeve **11** is mounted a gearwheel **29** which meshes with a gearwheel **31** mounted on the shaft of a driving motor **30**, and the sleeve together with the base member and the fingers can be given a rotational movement by means of the driving motor **30**. From the driving motor **30** a shaft **32** also leads to the gripper **5''** and is connected with an appropriate set of gearwheels to the base member and the fingers of this gripper. As a result, the gripper **5''** also can be given a rotational movement by means of the driving motor **30**, and it is guaranteed at the same time that the grippers **5'** and **5''** rotate synchronously and fingers situated opposite one another in the axial direction are always in the same pivoted position relatively to one another.

The base member **10** comprises at its outer end a bar-shaped flange **33** which cooperates in such a manner with a control slide **34** connected fixedly to the frame **13** that the fingers **9** in the axial extreme position in which the base member **10** is removed from the web of material **4**, assume the rotated position shown in FIGS. **4** and **6** i.e. are situated in the same horizontal plane passing through the base member axis. Beside the control slide **34** there are situated holding rails **35** which bound therewith compartments **36** receiving the flange **33**, and give the flange an additional support. Since the fingers of the gripper **5''** are coupled by means of the shaft **32** to the fingers of the gripper **5'**, they are also aligned by the flange **33** and the control slide **34**.

In the region of the guide roller **2** there is provided a brake block **37** which is pressed by means of a servomotor **38** against the web of material **4** on the guide roller and held fast. Below the holding device **6**, **7**, **8** there is arranged a pivotable tray **39** which in its lower position acts on a switch **40**. The mobile block **8** of the holding device is connected to a push member **8'** which on movement of the block **8** against the fixed block **6** moves along the tray **39** towards an outlet way **41** which leads to a collecting container or a conveying device. Between the winding element **3** and the holding device **6**, **7**, **8** there is arranged a cutting device **43** operated by a servomotor **42**. Directly above the fixed block **6** there is arranged a guide plate **44**. Provided between the guide roller **2** and the winding element **3** is a servomotor **45** by means of which two balls **46**, of which only one is shown in FIGS. **1**, **2**, **3** can be moved against the edge zone of the web of material **4**. Between the balls **46** and the winding element **3** there is arranged a fixed guide rail **47**.

Provided in the region of the guide roller 2 is a counting device 48 which counts the revolutions of the said roller and thus ascertains the length of the web run travelling over it. This counting device is constructed for example as a mechanical meter; however, it is also possible to use any known device, for example a photoelectric cell which cooperates with a disc having radial slots and fixed to the guide roller. The counting device 48 is connected to a control device 49 with a counting means and a programme emitter of known construction. The control device 49 is so connected to the servomotors 28 of the two grippers 5', 5'', to the joint driving motor 30 of the two grippers, the switch 40 and the servomotors 7, 38, 42, 45, that it automatically controls the programme described hereinafter. The programme emitter may be a motor-driven commutator switch. Such switches are known in the prior art and have been used to cause the sequential operation of a series of controlled motors, switches, valves and the like. See for example the DaRoza et al. U.S. Pat. No. 2,353,014.

To carry out the method according to the invention, the apparatus operates as follows. Before winding is begun, the grippers 5', 5'' are moved towards one another so that the fingers 9 grip the material web 4. Then the fingers or the base members (9 and 10 in FIG. 4) are rotated by the driving motor 30 and the web of material is wound on to the winding element 3 to form a wound package 50. As soon as the counting device 48 has ascertained a predetermined number of revolutions of the guide roller 2, i.e. a web run of predetermined length has been wound, the driving motor 30 is stopped so that the winding operation is interrupted. The end of this operating phase is shown in FIG. 1.

The next step consists in that the servomotors 28 are operated in the sense that their piston rods (27 in FIG. 4) are moved away from one another. The operations in both grippers are explained hereinafter with reference to FIG. 4. Owing to the movement of the piston rod 27 towards the left in the drawings the wedge 21 is moved out of the chamber bounded by the surfaces 20 of the fingers 9 and the fingers can now move towards one another. This movement is effected by the tightly wound, elastic web of material, which then sits freely on the fingers 9. The wedge 21 is moved further towards the left until its abutment 23 contacts the abutment 24 of the base member 10, and the base member then, together with the fingers 9, follows the movement of the wedge 21 towards the left away from the web of material 4, until the fingers are drawn out of the wound package 50. The same operation takes place simultaneously in the gripper 5''. At the same time the brake device 37, 38 is operated. Thus the wound package 50 is freed, and it is moved downwards by its own gravitational force i.e. it falls, guided by the guide plate 44, through between the blocks 6, 8 of the holding device on to the tray 39 which operates the switch 40 under the influence of the wound package weight. FIG. 2 shows the end of this phase of operations. The operation of the switch 40 has the result that the mobile block 8 is moved towards the fixed block 6 of the holding device, so that the section 51 of the web of material is held fast at a holding point between the winding element 3 and the wound package 50. Together with the block 8, the push member 8' moves towards the wound package 50 and pushes the latter on to the outlet way 41, where it is held by the web of material 51. By moving the balls 46 against the web of material, its section 51 is held taut and held by the guide rail 47 in such a manner that it goes through the axis of the grippers 5', 5''. FIG. 3 shows the end of this phase.

The next step consists in that the winding element 3 is again brought into engagement with the web of material 4. The fingers 9 and the grippers 5', 5'' have already, in their movement away from the web of material, been brought by the flange 33 of the base member 10 and the control slide 34 into the rotated position shown in FIGS. 4 and 6, in which all fingers are situated in the same horizontal plane. Owing to the inertia of the driving motor 30 and the set of gearwheels 29, 31 they also remain in this rotated position even when they are moved by the adjusting motors 28 towards the web of material 4.

When the grippers have again been brought into engagement with the web of material, the next step consists in beginning a new winding operation, which is continued only until the web of material is reliably seated on the fingers 9, which requires only a few revolutions. During the aforesaid short winding operation the section 51 of the material web is subjected between the winding element 3 and the holding device 6, 7, 8 to a slight tension, which is accepted by the elasticity of the material web.

The next step consists in that the web of material is severed at a point between the winding element 3 and the holding device 6, 7, 8, the holding point. What happens is that the web of material is cut through by the cutting device 42, 43. If the web of material has a transverse perforation, however, the tension to which the web of material is subjected during the short winding operation is also sufficient to tear the section 51. After the section 51 of the web of material has been severed, the brake block 37, the balls 46 and the mobile block 8 are again removed from the material web. The wound package 50 is thus free and can roll over the outlet way 41, and the section 51 is wound-on. When the material web 51 is torn, the brake block 37 is, of course, slightly released for the beginning of a new winding operation.

The method according to the invention and the apparatus according to the invention make it possible to reel a continuous web of material automatically into wound packages without requiring any manual intervention. In addition to the winding of webs of plastics material, the apparatus can also be used for the winding of paper webs e.g. webs of soft, so-called crepe paper, or textile material webs.

In the form of embodiment described, the wound package 50 has no core. Alternatively, the invention may be used for a wound package provided with a core which can consist e.g. of a cardboard tube. In this case, the grippers must be appropriately adapted, for example must have conical pins which are introduced into the two ends of the cardboard tube, and devices must be provided for the engagement of the material web and for bringing-in the cardboard tubes.

We claim:

1. A method of winding a continuous web of material to form wound packages, each of which has a predetermined web length, which comprises winding a run of the web onto a winding element thus forming a wound package; disengaging said winding element from said wound package thus freeing the latter; moving said wound package away from said winding element; holding fast said web at a holding point between said winding element and said wound package; bringing said winding element again into engagement with said web and beginning a new winding operation for only a few revolutions; severing said web between said winding element and said holding point; and finishing said new winding operation, the steps occurring in the order stated.

2. Apparatus for forming wound packages from a continuous web (1, 4) of material comprising a pair of opposed, coaxial rotary grippers (5', 5'') which are axially movable between a retracted position in which they are disengaged from the web and a winding position in which each gripper engages a corresponding edge of said web; means (29, 30, 31, 32) synchronously rotating said grippers, when in the winding position, whereby a wound package is formed, the grippers supporting said package during winding; reversible motor means (28) to move said grippers axially and position them selectively in said retracted or said winding position; a receiver (39) for the wound package and to which it gravitates when the grippers are retracted; opposed members (6, 8) extending transversely of the web and on opposite sides thereof, said members being relatively movable between web-releasing and web-clamping positions and located between the grippers and the receiver; and actuating means (7) selectively positioning said members in web-releasing position or in web-clamping position after said package gravitates into said receiver.

3. The apparatus defined in claim 2, in which said receiver comprises a pivotable tray (39) arranged below said members

(6, 8); a switch (40) operated by said pivotable tray under the influence of the weight of said wound package and causing said actuating means to move said members to said clamping position.

4. The apparatus defined in claim 3, and a push member (8') connected with said actuating means for pushing said wound package onto an outlet way (41) adjacent to said pivotable tray as said members are moved to clamping position.

5. The apparatus defined in claim 4, and a freely rotating guide roller (2) arranged above said grippers and over which said web is fed to the latter; and a brake device arranged in the region of said guide roller, consisting of a brake block (37); and a servomotor (38) for moving the latter toward said web thus holding it fast when the grippers are disengaged.

6. The apparatus defined in claim 5, and a cutting device arranged between said grippers and said members consisting of a cutting tool (42) and a servomotor (43) for operating the latter to cut said web transversely while it is clamped by said members.

7. The apparatus defined in claim 6 and a counting device (48) adapted to count the revolutions of said guide roller (2); a control device (49) comprising a counting means and a programme emitter; said control device (49) being operatively connected to said counting device (48), said means (29, 30, 31, 32) for rotating said grippers (5', 5'') and said motor means (28) for axially moving said grippers, said members (6, 8), said switch (40) of said pivotable tray (39), said brake device (37, 38) and said cutting device (42, 43) to control the following sequence of operations:

a. winding a section of said web (4) of predetermined length to form a wound package on said grippers (FIG. 1);
b. retracting said grippers (5', 5'') from said wound package thus freeing the latter, and operating said brake device (37, 38);
c. when said wound package has fallen onto said pivotable tray (39) whereby said switch (40) is operated (FIG. 2), operating said members and said push member (8') (FIG. 3);
d. bringing said grippers (5', 5'') into engagement with said web (4) and beginning said new winding operation;
e. after a few revolutions of said winding element (3), operating said cutting device (42, 43);
f. releasing said members and said brake device (27, 28), and withdrawing said push member (8') and said cutting device (42, 43); and finishing said new winding operation.

8. The apparatus defined in claim 2, in which each gripper (5', 5'') has two resilient fingers (9) arranged symmetrically with respect to the gripper axis and substantially parallel to said axis, and a servomotor (28) for axially moving said fingers; a driving motor (30) and means (29, 31, 32) connecting the latter with said fingers for synchronously rotating the latter; and a fixedly arranged control slide (34) and a flange (33) fast with one of said grippers (5') for pivoting said fingers (9), when moved into their retracted position remote from each other into a pivoted position in which said fingers (9) lie in a plane substantially perpendicular to said web (4).

9. The apparatus defined in claim 8, in which each gripper (5', 5'') includes a wedge (21) with its point directed toward said web (4) and arranged between said fingers (9); which wedge (21) is axially movable relatively to said fingers (9) in the gripper axis direction between on the one hand surfaces (20) converging toward said web (4) and on the other hand an abutment (24) of said fingers; by which wedge said fingers are held, in their extreme axial position neighboring each other, in a specific spread position.