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(54) **Method and machine for overwrapping products in sheets of thermoplastic material**

Verfahren und Maschine zum Umwickeln von Gegenständen in Bögen von thermoplastischen Material

Procédé et machine pour envelopper des articles dans des feuilles de matériau thermoplastique

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## Description

**[0001]** The present invention relates to a method of overwrapping products in sheets of thermoplastic material.

**[0002]** The present invention is particularly advantageous for use in the tobacco industry, and in particular on machines for cellophaning tobacco products, to which the following description refers purely by way of example.

**[0003]** On cellophaning machines, a succession of products, either packets or cartons, and a corresponding succession of sheets of transparent thermoplastic wrapping material, normally polypropylene, are fed to a wrapping wheel on which each sheet is wrapped about the respective product to form a wrapping, at least part of which is defined by superimposed portions of the respective sheet; and the wrapping so formed is then stabilized by heat-sealing the superimposed portions.

**[0004]** On known cellophaning machines, the heat-sealing step to stabilize the wrapping, which is normally performed by bringing high-temperature heat-sealing devices into contact for a given length of time with the superimposed portions of the sheet, presents major drawbacks, mainly due to the conflicting requirements the heat-sealing devices are expected to meet. That is, to ensure perfect heat-sealing at the maximum operating speed of the cellophaning machine, the temperature of the heat-sealing devices must be kept as high as possible, preferably just below the melting point of the thermoplastic material, to heat-seal the sheet as quickly as possible. Conversely, when the machine is operated for any reason at a slower speed, in which case, the heat-sealing devices are kept contacting the sheet for a longer period of time, a temperature just above the softening point of the material would be more suitable to prevent singeing or curling of the sheet.

**[0005]** On certain known cellophaning machines, the heat-sealing devices are set to a temperature just above the softening point of the sheet material, and are fed, together with the products and respective wrappings, along a relatively long path, the length of which is such as to ensure good-quality sealing even at maximum operating speed, while at the same time stabilizing the wrappings with no risk of singeing or ruining the sheets, due to the relatively low temperature of the heat-sealing devices, in the event the output speed of the machine is reduced.

**[0006]** The above solution, however, presents further drawbacks of its own by requiring the use of large-size conveyors, thus resulting in an increase in the overall size of the machine and in mechanical transmission problems.

**[0007]** GB901139 discloses an apparatus for welding package closure parts of thermoplastic films or foils, in which the packages to be closed are conveyed by a pair of belts past heating elements and, optionally, subsequently past cooling elements in the apparatus, with these belts running between the parts of the packages which are to be welded and the heating elements and, if used, the cooling elements, and in which a further locating means including a die is arranged after each of said heating elements in the direction of travel of the packages, the pressing surface of this die having a contour shape to correspond with that part of each package closure which is made up of more than one layer of film or foil. It is thus possible to merely set the heating elements to such a controlled temperature that heat is transferred to the closure parts of the packages in amounts such that closures of thinner cross section do not melt and closures of thicker cross sections are preheated and then welded and heat sealed by the application of additional heat and pressure from the associated heated pressing plungers. If the packages are to be continuously conveyed, the heated dies are preferably in the form of rotary cylinders, with the pressing surfaces embossed thereon. If the apparatus is designed for intermittent operation, the dies will preferably be movable in timed fashion backwards and forwards transverse to the direction of conveyance and each have a flat face, the pressing surfaces thereof being likewise embossed thereon.

**[0008]** The apparatus disclosed by GB901139 partially solves the aforementioned drawbacks; however, it does not ensure perfect heat-sealing at the maximum operating speed of the cellophaning machine and also at a low operating speed of the cellophaning machine.

**[0009]** It is an object of the present invention to provide a method of overwrapping products, designed to overcome the aforementioned drawbacks.

**[0010]** According to the present invention, there is provided a method of overwrapping products in sheets of thermoplastic material as recited by Claim 1.

**[0011]** By enabling the wrappings to be supplied to the heat-sealing devices at a temperature very close to, but still below, the softening temperature, the above method provides for extremely rapid heat-sealing, even with the heat-sealing devices at a relatively low temperature, as well as for eliminating any drawbacks (adhesion of the wrappings to the -respective conveyors, tearing of the sheets of overwrapping material, etc.) caused by premature softening of the sheets of overwrapping material.

**[0012]** The present invention also relates to a machine for overwrapping products in sheets of thermoplastic material.

**[0013]** According to the present invention, there is provided a machine for overwrapping products in sheets of thermoplastic material as recited by Claim 4.

**[0014]** A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic side view, with parts in section and parts removed for clarity, of a preferred embodiment of the machine according to the

present invention;

Figure 2 shows a plan view of the Figure 1 machine.

**[0015]** Number 1 in the accompanying drawings indicates a cellophaning machine for overwrapping packets 2 - in the example shown, packets of cigarettes - with sheets 3 of transparent thermoplastic material, preferably polypropylene.

**[0016]** Machine 1 presents an output portion 4 comprising a substantially cylindrical wrapping wheel 5, which in turn presents a number of axial peripheral conveying pockets 6 open both radially outwards and at both axial ends, and a powered shaft 7 for rotating wheel 5 in steps clockwise in Figure 1.

**[0017]** When arrested at a loading station 8, each pocket 6 simultaneously receives a respective sheet 3 of transparent wrapping material supplied by known supply means (not shown), and a packet 2 supplied by known supply means (not shown) which, in known manner, insert the packet 2 and respective sheet 3 into pocket 6 so as to fold sheet 3 in a U about packet 2.

**[0018]** During the stop at loading station 8 and in the course of the next step forwards of station 8, the ends of the U-folded sheets 3 are engaged and folded one on top of the other by known movable and fixed folding devices 9a and 9b to form a tubular wrapping 10, the open opposite ends of which project from the open axial ends of respective pocket 6.

**[0019]** Each pocket 6 feeds respective packet 2 and respective wrapping 10, which form a group indicated as a whole by 11, through at least one heat-sealing station 12 (in the example shown, stations 12 are two in number) where each group 11 is arrested to enable a respective known outer axial heat-sealing device 13 to be brought into contact with and completely heat-seal the superimposed ends of wrapping 10 before group 11 reaches an unloading station 14.

**[0020]** Wrapping wheel 5 comprises two parallel, coaxial disks 15 (only one shown) fitted a given distance apart to shaft 7, and each presenting a number of peripheral cavities, each of which, together with a corresponding cavity on the other disk 15, defines a respective pocket 6.

**[0021]** In addition to wheel 5, portion 4 also comprises a conveyor assembly 16 in turn comprising an initial or input conveyor 17, an intermediate conveyor 18, and a final or output conveyor 19.

**[0022]** Conveyor 17 comprises a belt 20 looped about two pulleys 21 and 22, the first of which is mounted in a fixed position between disks 15 of wheel 5, and the second of which is a powered pulley rotating continuously clockwise (in Figure 1) about an axis 23 parallel to shaft 7, to feed the conveying branch 24 of belt 20 through station 14 and in a direction 25 substantially radial in relation to disks 15 and directed outwards in relation to wheel 5. Conveyor 17 also comprises a plate 26 facing the portion of branch 24 extending outside wheel 5 to define, with branch 24, a channel 27 of a height approximately equal to but no smaller than the thickness of groups 11, and defined laterally by known fixed helical folding devices 28 for folding the opposite ends of tubular wrappings 10 on to the respective ends of respective packets 2 as groups 11 travel along channel 27, and so forming closed wrappings 29.

**[0023]** Belt 20 presents a number of projections 20a equally spaced along belt 20 with a spacing greater than the width of groups 11, and forms, for groups 11, a non-reciprocating extracting device capable of operating at relatively high speed.

**[0024]** Conveyor 19 comprises a drum 30 fitted to a powered shaft 31 so as to rotate clockwise (in Figure 1) about an axis 32 parallel to axis 23, and presenting a central annular groove 33 along which are equally spaced a number of known seats 34, which rotate with drum 30 along a circular path P coaxial with axis 32, and each provide for receiving and retaining a respective group 11. Groove 33 presents a width approximately equal to but no smaller than the length of a wrapping 29, and defines, on drum 30, two lateral disks 35, each of which is fitted, at each seat 34, with a heat-sealing element 36. Each seat 34 therefore presents two heat-sealing elements 36 facing each other and each facing, in use, a respective longitudinal end of a respective wrapping 29.

**[0025]** In actual use, as drum 30 rotates, groups 11, generally retained inside respective seats 34 by suction, are fed to an unloading station 37 where they are transferred on to an output wheel 38.

**[0026]** Throughout its travel along the periphery of drum 30, each group 11 is kept contacting the respective pair of heat-sealing elements 36, which are normally pushed towards each other by respective known actuating devices (not shown) to heat-seal the ends of respective wrapping 29.

**[0027]** Groups 11 are transferred from conveyor 17 to conveyor 19 by intermediate conveyor 18, which comprises an elongated plate 39 parallel to direction 25, coplanar with branch 24 of belt 20 and tangent to path P of seats 34; and a belt 40 looped about two pulleys 41 parallel to axis 23 and one of which is powered. Belt 40 presents a conveying branch 42 parallel to and facing plate 39 to define, with plate 39, a channel 43 coaxial with channel 27; and a number of projections 44 equally spaced along belt 40 with a spacing greater than the width of groups 11.

**[0028]** As shown in Figure 2, the opposite lateral ends of channel 43 are closed by two belts 45, each of which is looped about two pulleys 46 - one of which is powered - with respective axes perpendicular to axis 23, and comprises a branch 47 extending, parallel to direction 25, between plate 39 and branch 42 of belt 40. The surface of each branch 47 opposite to that facing branch 47 of the other belt 45 is connected in sliding manner to a respective heating plate 48 integral with the end of a linear actuator 49 for moving plate 48 towards the other plate 48 and controlling the width of channel 43 as a

function of the speed of machine 1.

**[0029]** Together with respective actuators 49 and respective belts 45, plates 48 define an adjustable preheating unit 50 for heating the folded ends of wrappings 29 to a temperature below the softening temperature of the material of sheets 3.

**[0030]** According to a variation not shown, conveyors 17, 18 and 19 are replaced by a single conveyor presenting a single belt looped about pulley 21 and drum 30, and presenting a conveying branch extending along channels 27 and 43 and partly about drum 30 along path P.

**[0031]** Operation of output portion 4 of machine 1 is clearly understandable from the drawings and the above description with no further explanation required.

**[0032]** It should be stressed, however, that, even when machine 1 is operated at maximum speed, preheating unit 50 provides for maintaining heat-sealing elements 36 at just above the softening temperature for a relatively short period of time to heat-seal and stabilize the folded ends of wrappings 10. This therefore provides not only for substantially eliminating the possibility of sheets 3 melting and/or being singed, but also for minimizing the length of the portion of the path of products 2 affected by heat-sealing elements 36, and so reducing the overall size of machine 1. In this connection, it should be pointed out that, if heat-sealing elements 36 are set to operate at 150°C, preheating sheets 3 to a temperature of 100°C provides for reducing the normal heat-sealing time to roughly one fifth of that required with no preheating. Moreover, preheating to below the softening temperature of the material of sheets 3 prevents part of the material of sheets 3 from adhering to and so fouling belts 45.

## Claims

1. A method of overwrapping products (2) in sheets (3) of thermoplastic material, the method comprising the steps of feeding a product (2) continuously along a given path together with a respective sheet (3) of overwrapping material; imparting to the sheet (3) a folded configuration about the product (2) along an initial portion (17) of said path; preheating, along an intermediate portion (18) of said path, at least part of the sheet (3) to a temperature close to the softening temperature of said material; and stabilizing, by means of heat-sealing, the sheet (3) in the folded configuration along a final portion (19) of said path; **characterized in that** said preheating step comprises a substep of regulating the amount of heat transmitted during preheating to said sheets (3) as a function of a traveling speed of the sheets (3) and respective products (2) along the intermediate portion (18) of said path.

2. A method as claimed in Claim 1, wherein at least part of the sheet (3) is preheated by means of heating means (50) comprising two heating plates (48) located along and on either side of said intermediate portion (18) and cooperating with respective said ends of the tubular wrappings (10); the amount of heat transmitted during preheating to said sheets (3) is regulated by adjusting a distance between the heating plates (48)

3. A method as claimed in Claim 1 or 2, wherein said folded configuration is imparted to each sheet (3) by folding the sheet (3) about a respective product (2) to form a tubular wrapping (10) presenting open opposite ends, and by further folding the sheet (3) to close said ends; the sheet (3) being preheated and then heat-sealed at said ends.

4. A machine for overwrapping products in sheets (3) of thermoplastic material, the machine comprising conveying means (17, 18, 19) having an initial portion (17), an intermediate portion (18) and a final portion (19) and being designed for continuously feeding a product (2) along a given path together with a respective sheet (3) of overwrapping material; folding means (9a, 9b, 28) for imparting to the sheet (3) a folded configuration about the product (2); heating means (50) provided along said intermediate portion (18) to preheat at least part of the sheet (3) to a temperature close to the softening temperature of said material; and heat-sealing means (36) located at said final portion (19) and for stabilizing the sheet (3) in the folded configuration; **characterized in that** said heating means (50) also comprise regulating means (49) for regulating the amount of heat transmitted during preheating to said sheets (3) as a function of a traveling speed of the sheets (3) and respective products (2) along the intermediate portion (18) of said path.

5. A machine as claimed in Claim 4, wherein the heating means (50) comprise two heating plates (48) located along and on either side of said intermediate portion (18) and cooperating with respective said ends of the tubular wrappings (10); said regulating means (49) comprise actuating means (49) connected to said heating plates (48) to adjust a distance between the heating plates (48) as a function of a traveling speed of said intermediate portion (18).

6. A machine as claimed in Claim 4 or 5, wherein said folding means (9a, 9b, 28) comprise first folding devices (9a, 9b) for folding each sheet (3) about a respective product (2) to form a tubular wrapping (10) presenting open opposite ends; and a second folding device (28) for further folding the sheet (3) to close said ends; said heating means (50) operating on said ends.

**7.** A machine as claimed in Claim 4, 5 or 6, wherein said heating means (50) also comprise two continuously-moving belts (45) interposed between said heating plates (48) to laterally define a channel (43) for feeding the products (2) along said intermediate portion (18).

**8.** A machine as claimed in one of the foregoing Claims from 4 to 7, wherein said initial portion is defined at least partly by a straight, continuously-moving first conveyor (17); said second folding device being located along said continuously-moving first conveyor (17).

**9.** A machine as claimed in Claim 8, wherein said intermediate portion (18) is defined by a straight, continuously-moving second conveyor.

**10.** A machine as claimed in any one of the foregoing Claims from 4 to 9, wherein said final portion (19) is defined by a conveyor drum (30) movable continuously about its axis (32); said conveyor drum (30) being tangent to said intermediate portion (18).

**11.** A machine as claimed in Claim 10, wherein said drum (30) comprises a number of seats (34), each for receiving a respective product (2); said heat-sealing means (36) comprising two heat-sealing elements (36) for and movable with each said seat (34).

**Patentansprüche**

**1.** Verfahren zum Umwickeln von Gegenständen (2) mit Bögen (3) aus thermoplastischem Material, umfassend die Schritte: Fortwährendes Zuführen eines Gegenstandes (2) entlang einer vorgegebenen Bahn zusammen mit einem jeweiligen Bogen (3) aus Umhüllungsmaterial; Umformen des Bogens (3) in einen gefalteten Zustand um den Gegenstand (2) entlang eines Anfangsbereiches (17) der Bahn; Vorwärmen von zumindest einem Teil des Bogens (3) entlang eines Zwischenbereiches (18) der Bahn auf eine Temperatur nahe der Erweichungstemperatur des Materials; und Stabilisierung des Bogens (3) in dem gefalteten Zustand mittels Heißversiegelung entlang eines Endbereiches (19) der Bahn; **dadurch gekennzeichnet, dass** der Vorwärmschritt einen Unterschritt zur Regelung der Wärmemenge während der Vorwärmung der Bögen (3) als Funktion der Transportgeschwindigkeit der Bögen (3) und der jeweiligen Gegenstände (2) entlang des Zwischenbereiches (18) der Bahn umfasst.

**2.** Verfahren nach Anspruch 1, bei welchem zumindest ein Teil des Bogens (3) mittels einer Heizeinrichtung (50) vorgewärmt wird, welche zwei Heizplatten (48) aufweist, die entlang des Zwischenbereiches (18) und auf jeder Seite von diesem angeordnet sind und mit den jeweiligen Enden der rohrformigen Umhüllungen (10) zusammenwirken; wobei die während des Vorwärmens auf die Bögen (3) übertragene Wärmemenge durch Einstellung eines Abstandes zwischen den Heizplatten (48) geregelt wird.

**3.** Verfahren nach Anspruch 1 oder 2, bei welchem der gefaltete Zustand jedem Bogen (3) durch Falten des Bogens (3) um einen jeweiligen Gegenstand (2) die Form einer rohrförmigen Umhüllung (10) verleiht, welche offene, sich gegenüberliegende Enden aufweist, und die Enden durch weiteres Falten des Bogens (3) geschlossen werden, wobei der Bogen (3) vorgewärmt und danach an den Enden heiß versiegelt wird.

**4.** Maschine zum Umwickeln von Gegenständen mit Bögen (3) aus thermoplastischem Material, wobei die Maschine umfasst: Fördermittel (17, 18, 19), welche einen Anfangsbereich (17), einen mittleren Bereich (18) und einen Endbereich (19) aulweisen und zur fortwährenden Zuführung eines Gegenstandes (2) entlang einer vorgegebenen Bahn zusammen mit einem jeweiligen Bogen (3) aus Umhüllungsmaterial vorgesehen sind; eine Falteinrichtung (9a, 9b, 28) zur Umformung des Bogens (3) in einen gefalteten Zustand um den Gegenstand (2); eine Heizeinrichtung (50), welche entlang des mittleren Bereiches (18) vorgesehen ist, um zumindest einen Teil des Bogens (3) auf eine Temperatur nahe der Erweichungstemperatur des Materials vorzuwärmen; und eine Heißversiegelungseinrichtung (36), welche im Endbereich (19) zur Stabilisierung des Bogens (3) im gefaltetem Zustand angeordnet ist; **dadurch gekennzeichnet, dass** die Heizeinrichtung (50) auch eine Regelungseinrichtung (49) zur Regelung der Wärmemenge umfasst, die während des Vorwärmens des Bogens (3) als Funktion der Fördergeschwindigkeit der Bögen (3) und der jeweiligen Gegenstände (2) entlang des mittleren Bereiches (18) der Bahn einwirkt.

**5.** Maschine nach Anspruch 4, bei welcher die Heizeinrichtung (50) zwei Heizplatten (48) umfasst, die entlang des Zwischenbereiches (18) und auf jeder Seite von diesem angeordnet sind und mit den jeweiligen Enden der rohrförmigen Umhüllung (10) zusammenwirken; wobei die Regelungseinrichtung (49) eine Betätigungseinrichtung (49) umfasst, die mit den Heizplatten (48) verbunden ist, um einen Abstand zwischen den Heizplatten (48) als Funktion der Fördergeschwindigkeit im Zwischenbereich (18) einzustellen.

**6.** Maschine nach Anspruch 4 oder 5, bei welcher die

Falteinrichtung (9a, 9b, 28) eine erste Falteinrichtung (9a, 9b) zum Falten jedes Bogens (3) um den jeweiligen Gegenstand (2) umfasst, um eine rohrförmige Umhüllung (10) zu bilden, welche offene, sich gegenüberliegende Enden aufweist; sowie eine zweite Falteinrichtung (28) zum Weiterfalten des Bogens (3), um die Enden zu schließen; wobei die Heizeinrichtung (50) an den Enden wirksam wird.

**7.** Maschine nach den Ansprüchen 4, 5 oder 6, bei welcher die Heizeinrichtung (50) außerdem zwei sich kontinuierlich bewegende Bänder (45) umfasst, welche zwischen den Heizplatten (48) angeordnet sind, um seitlich einen Kanal (43) zur Zuführung der Gegenstände (2) entlang des Zwischenbereiches (18) zu bilden.

**8.** Maschine nach einem der vorhergehenden Ansprüche 4 bis 7, bei welcher der Anfangsbereich zumindest teilweise als ein gerader, sich kontinuierlich bewegender erster Förderer (17) ausgebildet ist; und die zweite Falteinrichtung entlang des sich kontinuierlich bewegenden ersten Förderers (17) angeordnet ist.

**9.** Maschine nach Anspruch 8, bei welcher der Zwischenbereich (18) durch einen geraden, sich kontinuierlich bewegenden zweiten Förderer gebildet wird.

**10.** Maschine nach einem der vorhergehenden Ansprüche 4 bis 9, bei welcher der Endbereich (19) durch eine Fördertrommel (30) gebildet wird, die sich kontinuierlich um ihre Achse (32) bewegt; und die Fördertrommel (30) tangential zum Zwischenbereich (18) angeordnet ist.

**11.** Maschine nach Anspruch 10, bei welcher die Trommel (30) eine Anzahl von Sitzen (34) umfasst, wobei jeder zur Aufnahme eines jeweiligen Gegenstandes (2) dient; und die Heizeinrichtung (36) zwei Heißversiegelungselemente (36) für jeden Sitz (34) umfasst, die mit diesem bewegbar sind.

**Revendications**

**1.** Procédé pour envelopper des produits (2) dans des feuilles (3) en matériau thermoplastique, le procédé comprenant les étapes de : fourniture d'un produit (2) de façon continue, le long d'une trajectoire donnée, conjointement avec une feuille (3) respective de matériau d'enveloppement, façonnage de la feuille (3) pour lui donner une configuration pliée autour du produit (2), le long d'une partie (17) initiale de ladite trajectoire ; préchauffage, le long d'une partie intermédiaire (18) de ladite trajectoire, d'au moins une partie de la feuille (3), à une température proche de la température d'assouplissement dudit matériau; et stabilisation, par thermo-scellage, de la feuille (3) dans la configuration pliée, le long d'une partie finale (19) de ladite trajectoire ; **caractérisé en ce que** ladite étape de préchauffage comprend une sous-étape de régulation de la quantité de chaleur transmise durant le préchauffage vers lesdites feuilles (3), en fonction d'une vitesse de déplacement des feuilles (3) et des produits (2) respectifs, le long de la partie intermédiaire (18) de ladite trajectoire .

**2.** Procédé selon la revendication 1, dans lequel au moins une partie de la feuille (3) est préchauffée par des moyens de chauffage (50) comprenant deux plaques de chauffage (48), placées le long et de chaque côté de ladite partie intermédiaire (18) et coopérant avec lesdites extrémités respectives des enveloppements tubulaires (10); la quantité de chaleur transmise pendant le préchauffage auxdites feuilles (3) est réglée par ajustement d'une distance entré les plaques de chauffage (48).

**3.** Procédé selon la revendication 1 ou 2, dans lequel ladite configuration pliée est imposée à chaque feuille (3) en pliant la feuille autour d'un produit (2) respectif, pour former un enveloppement (10) tubulaire, présentant des extrémités opposées ouvertes et en pliant en outre la feuille (3) pour fermer lesdites extrémités; la feuille (3) étant préchauffée puis thermo-scellée auxdites extrémités.

**4.** Machine pour envelopper des produits dans des feuilles (3) de matériau thermoplastique, la machine comprenant des moyens de transport (17, 18, 19) ayant une partie initiale (17), une partie intermédiaire (18) et une partie finale (19) et étant conçue pour fournir en continu un produit (2) le long d'une trajectoire donnée, conjointement avec une feuille (3) respective de matériau d'enveloppement; des moyens de pliage (9a, 9b, 28) pour imposer à la feuille (3) une configuration pliée autour du produit (2); des moyens de chauffage (50) prévus le long de ladite partie intermédiaire (18) pour préchauffer au moins une partie de la feuille (3) à une température proche de la température d'assouplissement dudit matériau; et des moyens de thermoscellage (36) placés à ladite partie finale (19) et destinés à stabiliser la feuille (3) dans la configuration pliée; **caractérisée en ce que** lesdits moyens de chauffage (50) comprennent également des moyens de régulation (49) pour régler la quantité de chaleur transmise, durant le préchauffage, auxdites feuilles (3), en fonction d'une vitesse de déplacement des feuilles (3) et des produits respectifs (2), le long de la partie intermédiaire (18) de ladite trajectoire.

**5.** Machine selon la revendication 4, dans laquelle les moyens de chauffage (50) comprennent deux plaques de chauffage (48) placées le long et de chaque côté de ladite partie intermédiaire (18) et coopérant avec lesdites extrémités respectives des enveloppements tubulaires (10); lesdits moyens de régulation (49) comprennent des moyens d'actionnement (49) connectés auxdites plaques de chauffage (48) pour ajuster une distance entre les plaques de chauffage (48) en fonction d'une vitesse de déplacement de ladite partie intermédiaire (18).

**6.** Machine selon la revendication 4 ou 5, dans laquelle lesdits moyens de pliage (9a, 9b, 28) comprennent des premiers dispositifs de pliage (9a, 9b) pour plier chaque feuille (3) autour d'un produit (2) respectif, de manière à former un enveloppement (10) tubulaire présentant des extrémités opposées ouvertes; et un deuxième dispositif de pliage (28) pour plier en outre la feuille (3) de manière à fermer lesdites extrémités; lesdits moyens de chauffage (50) fonctionnant sur lesdites extrémités.

**7.** Machine selon la revendication 4, 5 ou 6, dans laquelle lesdits moyens de chauffage (50) comprennent également deux courroies (45) à déplacement continu, interposées entre lesdites plaques de chauffage (48) afin de définir latéralement un canal (43) pour fournir les produits (2) le long de ladite partie intermédiaire (18).

**8.** Machine selon l'une des revendications 4 à 7 précédentes, dans laquelle ladite partie initiale est définie au moins partiellement par un premier convoyeur (17) rectiligne à déplacement continu; ledit deuxième dispositif de pliage étant placé le long dudit premier convoyeur (17) à déplacement continu.

**9.** Machine selon la revendication 8, dans laquelle ladite partie intermédiaire (18) est définie par un deuxième convoyeur rectiligne, à déplacement continu.

**10.** Machine selon l'une quelconque des revendications 4 à 9 précédentes, dans laquelle ladite partie finale (19) est définie par un tambour de convoyeur (30) déplaçable de façon continue autour de son axe (32); ledit tambour de convoyeur (30) étant tangent à ladite partie intermédiaire (18).

**11.** Machine selon la revendication 10, dans laquelle ledit tambour (30) comprend une pluralité de sièges (34), chacun étant destiné à recevoir un produit (2) respectif; lesdits moyens de thermo-scellage (36) comprenant deux éléments de thermo-scellage (36) pour déplacer chaque dit siège (34), et se déplacer avec lui.

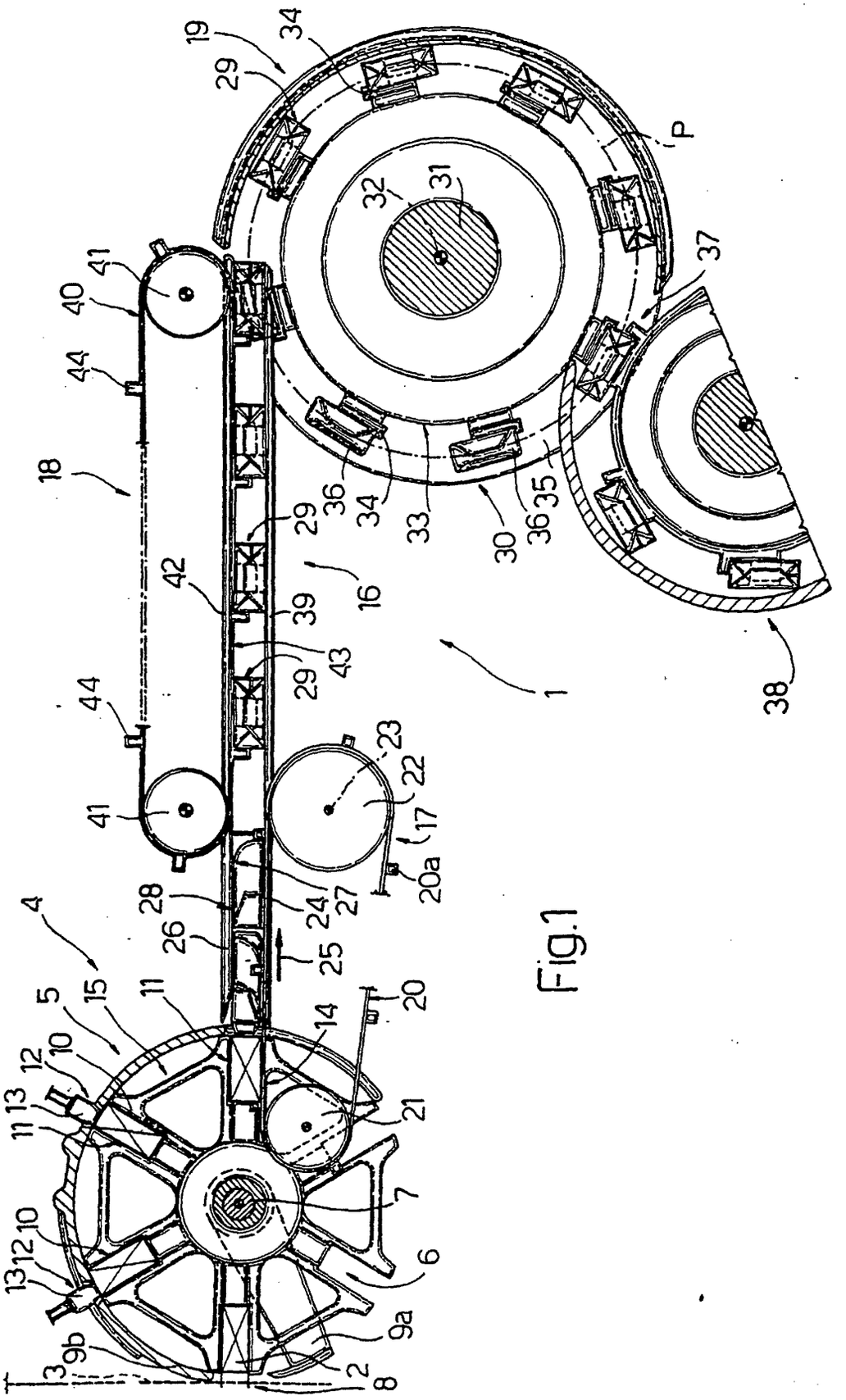

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Fig.1

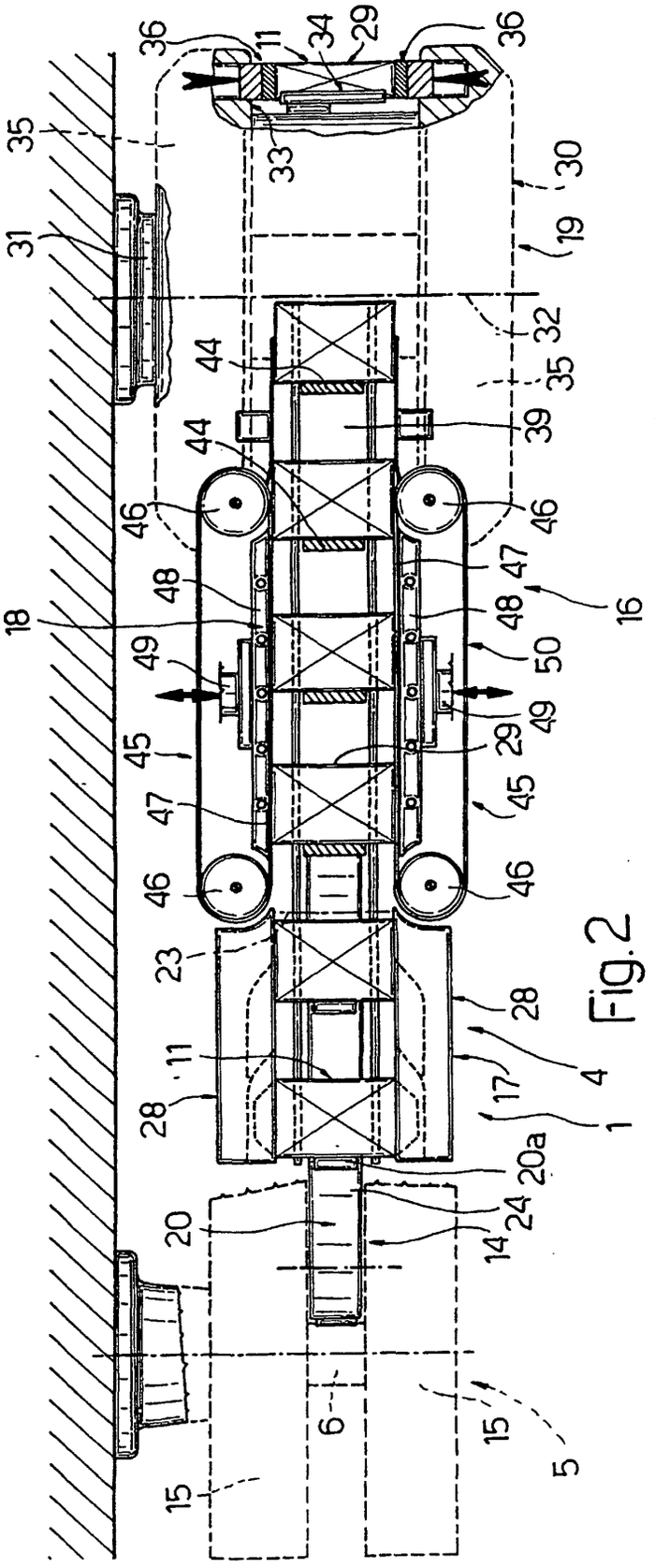

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Fig.2