

(19)



(11)

EP 1 276 667 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
01.07.2009 Bulletin 2009/27

(51) Int Cl.:
B65B 9/12 (2006.01) **B65B 51/30** (2006.01)

(21) Application number: **01949292.5**

(86) International application number:
PCT/EP2001/004484

(22) Date of filing: **19.04.2001**

(87) International publication number:
WO 2001/081175 (01.11.2001 Gazette 2001/44)

(54) **MACHINE FOR PACKAGING MATERIAL IN A LONGITUDINALLY AND TRANSVERSALLY SEALED TUBE**

VORRICHTUNG ZUM VERPACKEN VON MATERIALIEN IN EINEM LÄNGS- UND QUERGESCHWEISSTEN SCHLAUCH

MACHINE POUR EMBALLER DU MATERIAU DANS UN TUBE HERMETIQUEMENT CLOS LONGITUDINALEMENT ET TRANSVERSALEMENT

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**

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(30) Priority: **20.04.2000 SE 0001477**

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(43) Date of publication of application:
22.01.2003 Bulletin 2003/04

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a packaging machine for packaging pourable food products and which comprises means for longitudinally sealing a web of continuous packaging material to form a tube. A number of pairwise cooperating sealing jaws are provided which operate in a reciprocating manner for clamping and sealing there between the product filled tube at regularly spaced intervals. Position controlling means are provided to ensure that serving means provided on the web are positioned correctly on finished, sealed packages. Serving means are here taken to mean designs, perforations, straw holes etc.

[0002] The invention also relates to a method of position controlling in a packaging machine for packaging pourable food products of the above mentioned kind including the steps of; feeding a continuous web of packaging material; forming the web into a tube; sealing the tube longitudinally; filling the tube with a pourable food product; detecting equidistantly provided markings or similar on the web. The invention still further relates to an arrangement for position controlling in a packaging machine. Particularly the invention relates to design correction.

STATE OF THE ART

[0003] It is well known to produce packages for liquid or pourable food products from a roll of packaging material which comprise layers of fibrous material, such as paper, which is covered on both sides with a thermoplastic material e.g., polyethylene. The side of the packaging material that may be in contact with the food product in the package also comprises a layer of barrier material, e.g. an aluminium foil which is coated with a thermoplastic material. To produce packages of the above mentioned kind, packaging machines are fed from a roll of packaging material in web form as referred to above. The packaging material is sterilized preferably in the packaging machine through the application of a chemical sterilization agent, for example a hydrogen peroxide solution. During the sterilization step the sterilization agent is also finally removed from the surfaces of the packaging material, e.g. through heat vapourisation.

[0004] The sterilized packaging material is then formed into a tube which is longitudinally sealed. The tube is filled with a sterilized pourable food product. Examples on such pourable food product are for example fruit juice, pasteurized or ultra-high temperature treated (UHT) milk, wine, tomato sauce, vanilla sauce or high viscosity products in general etc. The filled tube subsequently passes between (a) pair(s) of endless chains or reciprocating members carrying sealing means, particularly heat sealing jaws on one chain of a pair and counter sealing jaws on the other chain, wherein the sealing

means clamp and seal the tube at regularly spaced intervals. The resulting sealed packaging materials bands are then cut between consecutive filled and sealed packages thus giving a number of separate packages.

[0005] Different kinds of packages are known, e.g. parallepipiped packages. Such are known as for example Tetra Brik™. Another known package is the so called Tetra Prisma™ which is a parallepipiped package with bevelled surfaces. To produce such packages two endless chain conveyers are provided which are provided with a number of sealing jaws and counter sealing jaws respectively. The two endless chains define respective endless paths which face each other and are parallel to each other and between which the tube of packaging material is fed. The (heat sealing) jaws on one endless chain cooperate with corresponding counter pressure sealing jaws on the other endless chain in a reciprocating movement to clamp the tube at regular distances and to seal it such that transversal seals are provided and pillow-shaped packages are resulting which then may be formed into the final shape, e.g. through folding, which however not is relevant for the present invention.

[0006] Tetrahedrally shaped packages as for example Tetra Classic" or Tetra Classic Aseptic™ are also known. Then there are two pairs of endless chain conveyers. Each pair consists of one endless chain carrying (heat) sealing jaws and another carrying counter sealing jaws so that upon the clamping and sealing operation, which is carried out alternately by the jaws on the respective pairs such that a first sealed band of material extending in a first direction is followed by a subsequent sealed band of material extending in a direction perpendicular to it etc. in an alternating manner. In that way tetrahedrally shaped packages are produced.

[0007] Often the packaging material is pre-printed on one side with a succession of identical, equally spaced design patterns which are to be located on the portions that eventually will form the outer surfaces of the packages. The packaging material web may also be provided with for examples straw holes, perforations or perforated corners etc. In this application the designs, straw holes, perforations etc. are all denoted serving means in that they in one way or another serve the user or the manufacturer. Common for these serving means is that their location on a finished package should not vary from one packages to another, i.e. in other words the packaging material web has to be positioned correctly to ensure that the printed design and/or straw hole and/or opening device such as a perforated corner portion be positioned correctly on a finished package. It is however difficult to ensure that the tube of packaging material be fed such that the packages are formed, sealed and finally cut in such a way that the designs etc. are correctly located. The packaging material may be deformed during operation since it is subjected to mechanical deformation, heat, the formed tube is filled by a product etc. Variations may also be produced during the preprinting operation (or during forming of perforations etc).

[0008] Known example on packaging machines as referred to above are the packaging machines known as TBA/19 and TBA/21, available from Tetra Brik Packaging Systems, Via Delfini 1, Modena, Italy, for manufacturing parallelepiped packages known registered trademark Tetra Brik™ or parallelepiped packages with bevelled corners known by the registered trademark Tetra Prisma™. In these known machines automatic design correction systems are used having folding flaps connected to the sealing jaws of the machine in order to pull more or less material into the forming and sealing members of the packaging machine during operation. Such arrangements are described in EP-A-887 265 and IT Patent 1 296 062 granted on June 9, 1999. These solutions are however quite complicated. Moreover if the concepts were to be implemented for the production of tetrahedrally shaped packages, they would be even more complicated.

[0009] It is also known to use a so called folding ruler above each sealing jaw of the packaging machine in order to adjust the length of the path of packaging material web so as to ensure that the printed design is positioned correctly on the finished package. This is e.g. known from the production of tetrahedrally shaped packages. However, to use such folding rulers is disadvantageous in that, if during a production run, the packaging material web is found not to be positioned correctly with the respect to the finished package, production actually has to be stopped and the folding rulers have to be replaced with shorter or longer folding rulers in order to provide for the needed design correction before production can be restarted. Thus, in other words the folding rulers have to be exchanged manually, and a number of different kinds of folding rulers need to be available, the operator needs to know which folding ruler to use etc., which is disadvantageous. This is both laborious and time consuming and moreover, if a production run is to be stopped, when starting up again, other problems may be introduced. Generally problems are produced at the start up phase of a machine since the operation of the sealing jaws have to be synchronized to the material web. For high speed operation packaging machines even a very small shift in a set theoretical location of designs may, if not corrected in real time, eventually increase to the point that packages have to be disposed of. For preformed perforations straw holes etc. pulling operations by e.g. folding flaps etc. and braking means needed to brake the web may be critical since a perforation may tear or be weakened, just as well as a straw hole, which is serious in that, then, not only the optics of the package is affected, but also its functionality. Thus, none of the suggested solutions works satisfactorily.

[0010] Known machines for producing Tetra Classic™/Tetra Classic Aseptic™ are TC/TCA 65 available from TetraPak Stålvall, Sweden.

SUMMARY OF THE INVENTION

[0011] It is therefore an object of the present invention

to provide a packaging machine as initially referred to through which position control is provided for such that serving means such as designs, straw holes or perforations are positioned correctly on finished packages. Particularly it is an object of the invention to provide a packaging machine through which position control, particularly design correction, can be done in a quick and precise manner and through which the position control can be performed in a continuous manner without requiring stops in the production run when deviations in position etc. are detected. It is also an object of the invention to provide a packaging machine which does not require operator invention.

[0012] Still further it is an object to provide a packaging machine as referred to above through which position control or design correction is enabled in an easy and uncomplicated manner. Particularly a packaging machine as initially referred to is needed which operates at a high speed and still assures that serving means, e.g. designs, straw holes etc. are positioned correctly on finished packages.

[0013] Still further an arrangement providing for position control, particularly design correction, in a packaging machine as initially referred to is needed through which the above mentioned objects can be met. Particularly an arrangement is needed which can be easily installed on existing packaging machines. Particularly a machine and an arrangement respectively as referred to above is needed which allows correction in real time and through which even minor shifts in the theoretical location of serving means, e.g. designs etc. as referred to above, can be handled at an early stage. A machine and an arrangement is also needed through which can be avoided that produced packages need to be disposed of because of incorrect location of designs, or other serving means.

[0014] More generally it is an object of the invention to provide a packaging machine and an arrangement respectively for continuously producing a septic sealed packages containing pourable food products through which the drawbacks typically associated with the known machines can be obviated as far as position control or design correction is concerned. Further yet it is an object to provide a packaging machine and an arrangement for use with a packaging machine respectively wherein position control/design correction can be achieved without producing a mechanical load on the web that might give rise to damages on e.g. perforations, straw holes etc.

[0015] Still further a method of position controlling in a packaging machine as initially referred to is needed through which the above mentioned objects are met.

[0016] Therefore a packaging machine as initially referred to is provided as claimed in claim 1 wherein the position controlling means comprises means for automatically and continuously adjusting the length of the path of the packaging material web before clamping and sealing such that the position of serving means provided on the package material web can be controlled to have a predetermined position on finished, sealed packages.

As referred to above the serving means may comprise designs, but also straw holes, perforations or similar.

[0017] The position controlling means are arranged to act up-stream of the respective sealing jaws. The position controlling means comprises folding rulers and actuating means. One of the sealing jaws of each pair of sealing jaws, particularly the counter sealing jaw, comprises one folding ruler which is slidably mounted in the sealing jaw. The folding ruler comprises a ruler part for acting on the material web and a rear part on which is actuated to slidably move the folding ruler with respect to the sealing jaw in which it is mounted. The actuating means can be operated to adjust the position of the ruler part of the folding ruler of each pair of sealing jaws thus adjusting the length of the path the web travels before clamping/sealing transversally. Advantageously retaining means are connected to the folding ruler in the sealing jaw which retaining means particularly consists of a spring biased towards the folding ruler and which on the opposite side carries a rotatable ball bearing.

[0018] The actuating means may comprise a pivotably mounted cam element actuating on the ball bearing and a driving means controlling the cam element in response to a signal from control means communicating with detecting means, e.g. a photocell for detecting the position/deviation in position of markings (or serving means) provided on the package material web. In one embodiment the driving means comprises a multistep air cylinder arrangement driving a link system connected to the cam element. The air cylinder arrangement may comprise three air cylinders connected in series with cylinder strokes of 2 mm, 1 mm and 0,5 mm respectively such that the folding ruler can be controlled to take any of seven different positions with respect to the sealing jaw in which it is mounted. In an alternative embodiment the driving means comprises a stepping motor.

[0019] The package material web can be provided with equidistantly spaced markings or index marks to be used by the detecting means for detecting the position of the markings, which detecting means are connected to a control unit controlling the actuating means. Instead of separately provided markings to be used exclusively for detection purposes, serving means may also be used for detection purposes, such as for example straw holes etc. In a particular embodiment the sealing jaws are arranged on endless chains such that, in operation, consecutive seals are provided which form an angle of substantially 90° with respect to each other such that tetrahedrally shaped packages are produced, c.f. for example Tetra Classic™ or Tetra Classic Aseptic™ as referred to earlier in the application.

[0020] Therefore also a method of position controlling in a packaging machine for packaging pourable food products as referred to earlier in the application is provided as claimed in claim 15. The method includes the steps of; detecting the position of markings or similar; and providing signals indicative of the position/deviation to control units. The method is characterized through the

steps of; automatically adjusting the distance the web travels before performing a transversal clamping/sealing operation by a pair of sealing jaws on the tubeshaped package material web, by activating actuation means acting on one folding ruler displaceably mounted with respect to one of the sealing jaws to adjust its position thus adjusting the path length of the material web before clamping/sealing transversally. Still further one sealing jaw in each pair comprises a folding ruler which is slidably mounted therein to act on the material web. Even more particularly the method includes the steps of; acting on a ball bearing connected to the folding ruler, which ball bearing is in contact with a cam element of the actuating means. Further yet the serving means may comprise design patterns, straw holes, perforations or similar. Advantageously the method includes the steps of; driving the actuating means using a stepping motor, an air cylinder arrangement or similar.

[0021] In an advantage of the present invention that a continuous and automatic control of for example the position of designs is enabled and particularly that an automatic and continuous design correction is enabled. It is also an advantage of the invention that an arrangement is provided which can be built into already existing machines as well as the concept can be used for when building the new packaging machines.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The invention will in the following be further described in a nonlimiting manner and with reference to the accompanying drawings, in which:

- FIG. 1A very schematically illustrates a packaging machine with position controlling means,
- FIG. 1B in an enlarged view schematically showing the stepping motor of Fig. 1A,
- FIG. 1C an enlarged view showing the detecting means of Fig. 1A,
- FIG. 2 schematically illustrates a cross-sectional view of a counter pressure sealing jaw with a folding ruler mounted therein,
- FIG. 3 illustrates a pair of cooperating sealing jaws of which one includes a folding ruler,
- FIG. 4A is a detailed view of a counter pressure sealing jaw with a folding ruler, retaining means and a ball bearing,
- FIG. 4B is an exploded view of the means of FIG. 4A,
- FIG. 5 shows the actuating means including driving means and a cam element according to a first embodiment,

- FIG. 6 shows the actuating means including driving means and a cam element according to a second embodiment,
- FIG. 7A illustrates the actuating means acting on the folding ruler and making it assume a first position with respect to the sealing jaw,
- FIG. 7B illustrates the actuating means acting on the folding ruler making it assume a second position with respect to the sealing jaw, and
- FIG. 8 very schematically illustrates a part of packaging machine with a multistep air cylinder as driving arrangement.

DETAILED DESCRIPTION OF THE INVENTION

[0023] Fig. 1 very schematically illustrates a packaging machine 100 for producing tetrahedrally shaped packages such as Tetra Classic™ or Tetra Classic Aseptic™. A preprinted material web 101 is provided on a roll from which it is fed to sterilizing means 102 in which the material web is exposed to e.g. hydrogen peroxide. Then it is fed on to heating means 103 for removing the sterilization agent, e.g. through heat vaporisation. The material web 101 passes breaking rollers 104, 104 and is subsequently formed into a tubular shape which is longitudinally sealed. Preprinted, markings (or serving means) are then detected by detecting means e.g. in the form of a photocell 105 for registering markings printed on the packaging material web. Alternatively there may be more than one photocell. The markings may also be of different kinds, index markings, bar codes, but they may also consist in the serving means themselves which then serve dual purposes, namely as indications (markings) and their actual purpose, e.g. a straw hole a perforation or similar. They may, according to different implementations be arranged inside or outside the tube. Moreover it is possible to perform the detection step before the web is formed into a tube. In one embodiment the photocell 105 reads markings which are equidistantly provided on the material web 101.

[0024] The information obtained by the photocell 105 is transmitted over cable 106 to control unit 107 which is arranged in association with the machine or externally of the machine. In the control unit 107 the information is processed and a decision is made as to whether the position needs to be corrected or not, and, as to how it is to be corrected. The control unit 107 is programmable and may e.g. calculate the position of the marking (and thus the position of the serving means with respect to a reference position corresponding to a desired position on a finished package). The control unit 107 controls the driving means 410 which in this embodiment comprises a stepping motor which is shown somewhat more in detail in Fig. 1B, of indication 1B of Fig. 1A. The position of the photocell 105 is somewhat more clearly illustrated in the

enlarged view 1C of Fig. 1C.

[0025] The driving means forms part of actuating means (not shown in Fig. 1A) acting on a folding rulers provided in association with the sealing jaws used for transversal clamping and sealing of the tube, which is filled by a product, at regular intervals. The functioning will be more thoroughly explained in the following.

[0026] Fig. 2 is a schematical, cross-sectional side view of a counter (pressure) sealing jaw 1 with a folding ruler 5. The counter sealing jaw 1 comprises a main body 2 to which first and second volume defining portions 3, 3 are connected via fastening means 4. A contact surface 6 contacts the web during the clamping and sealing step. The main body 2 is provided with attaching means 7 for connection to an endless chain (not shown) which drives a number of similar sealing jaws in a synchronous motion along the tubular material web (see Fig. 3) substantially in accordance with prior art machines. The attaching means 7 forms a pivot point for the sealing jaw with respect to the endless chain. A small guide roller 9 is located at the opposite end of the sealing jaw. A large guiding ruler 8 is arranged on the main body 2 for providing support of the sealing jaw during the final sealing phase. In this figure merely a folding ruler 5 is illustrated and it is not indicated how, according to the inventive concept, this folding ruler is slidably or displacably arranged which will be further described with reference to for example figures 4A, 4B.

[0027] Fig. 3 is a schematical illustration of counter sealing jaw 1 of Fig. 2 as cooperating with a heat sealing jaw 1' to clamp and heat seal the tubular web 101 provided therebetween. As in state of the art machines the sealing jaws 1, 1' are driven in a reciprocating manner to, at regular intervals, clamp and seal the web between them such that transversal seals are provided. Each of the sealing jaws 1, 1' are connected to an endless chain (not shown) each of which chains comprise a plurality of sealing jaws respectively for mutual cooperation as described above. For the production of tetrahedrally shaped packages another pair of such chains is provided perpendicularly to the aforementioned chains and cooperating jaws on the two pairs of endless chains act alternately such that consecutive, transversal seals will be provided perpendicularly in relation to each other. This is known from packaging machines for producing e.g. Tetra Classic™ or Tetra Classic Aseptic™.

[0028] Figs. 2 and 3 are merely illustrated to explain the functioning of sealing jaws wherein each counter pressure sealing jaw is provided with a folding ruler able to influence the path of travel of the material web 101.

[0029] Fig. 2 in principle is a cross-sectional view along the lines I-I of Fig. 3 and arrows C, C indicate the direction of movement of the sealing jaws for performing the clamping and sealing operation.

[0030] Fig. 4A illustrates a counter pressure sealing jaw 10 with a displacably or slidably mounted folding ruler 20 arranged between a first portion 11 and a second portion 12 serving as a bearing cover. The first and second

portions 11,12 are held together by bushings 18,18. A ball bearing 26 is connected to the folding ruler 20 so as to transmit a movement of a cam element of actuating means which are not shown in this figure. This will be further explained with reference to Figs. 5, 6, 7A, 7B.

[0031] The exploded view of Fig. 4B showing the counter pressure sealing jaw of Fig. 4A discloses in a more detailed manner how the ball bearing 26 actually is connected to the folding ruler 20 having a ruler part 21 for acting on the material web (not illustrated herein) and a rear part 22 on which is actuated to produce the sliding movement of the folding ruler 20 with respect to the sealing jaw 11,12 in which it is mounted.

Bearing rollers 16,16 are mounted on a shaft 15 and connected thereto by retaining rings 17,17.

Between the first and the second sealing jaw portions 11,12 a plain bearing 13 is provided and a plate 29 is fastened by screws to the first portion 11 for assembling purposes. The ball bearing 26 is mounted in retaining means or rod 25 by a pin crossing two holes at a fork shaped end portion of the retaining means or rod 25 between which it is held by washers 27,27. The opposite end of the retaining means 25 comprises a notch in which a protruding portion of the rear part 22 of the folding ruler 20 is introduced such that the retaining means 25 are active in displacing the folding ruler 20 in the direction of the movement produced on the ball bearing 26 by the actuating means (not shown herein). Mounted on the retaining part of rod 25 is a spring 23 urging the folding ruler outwards. The spring 23 is mounted on the part of the retaining means or rod 25 facing the folding ruler 20 via a bearing member 10. Thus, when the actuating means, via the cam element exerts a pressure on the ball bearing 26 rolling on the cam element (not shown), this force will be transferred via the retaining means 25, and urge the folding ruler 20 outwards with respect to the sealing jaw in which it is mounted and act on the material web so as to prolong the path the material web travels before it actually is clamped and heat sealed between the counter sealing jaw 10 and a cooperating heat sealing jaw (not shown).

[0032] In Fig. 5 actuation means 40 is illustrated in which the driving means 41 comprises a multistep air cylinder arrangement controlled by the programmable control unit (not shown in this figure) for activating a cinematic transmission procedure to change the position of the cam element 60 which determines the movement of the ball bearing 26 (not shown) as illustrated in Fig. 4A, 4B; c.f. also Figs. 7A, 7B below. The multistep cylinder arrangement may for example comprise a three step cylinder arrangement with three air cylinders arranged in series which have stroke length of 2 mm, 1 mm and 0,5 mm respectively, resulting in seven different positions corresponding to a displacement of 0,5 mm, 1 mm, 3,5 mm respectively. The fourth step may for example be taken to represent the basic setting case the path of the web need not to be changed i.e. no measure is taken to correct the position. Of course this merely relates to one

particular implementation and any kind of multistep cylinder arrangement may be used. The invention is of course not limited to the use of multistep cylinder arrangements as driving means but this merely relates to one particular implementation.

[0033] However, in this embodiment the multistep cylinder arrangement 41 is connected to a rod 42 which forms part of the link system 65 responsible for the mechanical transmission to change the position of the cam element 60. Rod 42 is connected to a lever 43 in that its end portion distant from the air cylinder arrangement 41 is introduced into a fork shaped portion of the lever 43. The lever 43 comprises a through hole which is vertically provided substantially at the center of the lever and it is connected to a bracket 51 via a protruding forked portion 54 which is vertically arranged and contains through holes to be arranged such that the through hole of the lever fits to the through holes of the fork shaped portion 54 through which holes a pin is inserted and fixed via a retaining ring and bushings 49. At the end portion of the lever 43 which is opposite to the portion at which the rod 42 is inserted, another through hole is provided to, via a screw 44 fixed by a nut 45, fasten an end portion of a compression rod 46. The compression rod 46 is spring biased by a spring 47 and a washer is inserted into the bracket 51 having a through hole arranged substantially at its midpoint and on the other side of which the other end portion of the compression rod 46 is connected to a forked link 56 which by a pin or similar is pivotably connected to the cam element 60. The cam element 60 substantially at its middle portion is provided with a hole for taking up the connecting pin 57 via the forked link 56. At the upper portion of the cam element 60 another through hole is provided on which another forked link 58 is arranged and fixed by a pin 59. This upper forked link is fixed to the housing of the machine and the cam element can be pivoted around the pivot point, formed by pin 59. At the opposite, free end point of the cam element sliders 63,63 are arranged on either side thereof and fastened to it by screws 64.

[0034] The movement transferred by the driving means 41 is transferred via the compression rod 46 connected to the cam element 60 via the forked link 56. The maximum response to a transferred movement from a driving means 41, thus is provided at the lower, free position of the cam element 60. The ball bearing 26 (not shown on this figure), rolls along the cam element 60 which will be more clearly illustrated through Figs. 7A, 7B. If the cam element is urged towards the ball bearing, the action is via retaining means transferred to the folding ruler which then prolongs the path the material web has to travel.

[0035] Fig. 6 shows an alternative embodiment of an actuating means 401 comprising a stepping motor.

Fig. 6 is a figure similar to that of Fig. 5 showing actuating means 400 including a stepping motor 410 as a driving means instead of the multistep air cylinder arrangement 41 of Fig. 5. The stepping motor 410 is via a ball bearing

(not shown) connected to an eccentric 412 which over a retaining ring (not shown) is connected to a proximity switch (not shown) in a conventional manner through a bracket 411. The eccentric and the proximity switch are connected to a securing means, e.g. here a ball joint eye 414, by a screw 413. A pin 415 is fastened to the ball joint eye 414 at one of the end portion and the other end portion of the pin 415 is connected a forked link 416 which by a pin 417 is connected to the cam element 420 which is similar to cam element 60 of Fig. 5. The upper part of the cam element is provided with a through hole for the connection of another forked link 418 via a pin 419. The cam element 420 is pivotably mounted via said fork link and fastening mean 422 to the machine housing such that the ball bearings associated with the sealing jaws on the endless chain contact the cam element 420 as discussed above.

[0036] In Figs. 7A and 7B respectively will be illustrated how the cam element acts on the ball bearing of a sealing jaw. It is shown how the actuating means 400 as shown in Fig. 6 including a stepping motor 410 actuates upon cam element 420 through a rod 415. The cam element 420 is fixedly attached to a fixed part of the machine housing by means 418 and it can be pivoted around pin or screw 419 forming a pivot point. In Fig. 7A the folding ruler 420 is supposed to be drawn in as much as possible and then there is no pressure exerted on the roller bearing 26 by the cam element 420. The path of the web is then shortened as compared to a basic setting. Fig. 7B illustrates a situation in which the web (not shown) is forced to take a longer path since the folding ruler 20 is urged outwards. The cam element 420 is pivoted counterclockwise around the pivot point since the stepping motor 410 via rod 415 forces to the right in the Figure thus urging the spring biased roller bearing 26 inwards relative to the sealing jaw 10. The roller bearing 26 which, as more thoroughly described with reference to Fig. 4A,4B, against the action of a spring (not shown herein) is urged towards the folding ruler 20 which then is pressed outwards, in other words the folding ruler can be said to become longer.

[0037] Of course any driving means can be used, not only a stepping motor or a multistep air cylinder arrangement but also e.g. hydraulic means can be used. The cam element can be also be substituted by other similar elements as long as a driving means in one way or another acts upon means, preferably a ball bearing, connected to a displaceably mounted folding ruler so as to displace it with reference to the sealing jaw.

[0038] Finally, Fig. 8 very schematically illustrates a part of machine housing 110, to the outside of which a multistep air cylinder arrangement 41 in Fig. 5 is fixed. The link system connecting to the cam element 60 is not shown in this figure since it passes through the bracket or machine housing but the forked link 56 connected to the cam element 60 is shown and it can also be seen how the forked link 58 is fixedly attached to the housing such that the cam element can pivot around the point of

attachment to the forked link 58. In the figure only one counter sealing jaw 10 is illustrated but it can be seen how the roller bearing 26 connected to the sealing jaw moves along the cam element 60 such that the position of the active length of, the folding ruler 20 can be controlled. As referred to earlier in the application a number of sealing jaws 10 are mounted on an endless chain for cooperation with a number of sealing jaws provided on another chain to clamp a material web there between. If tetrahedrally packages are to be provided, there are two more endless chains carrying counter pressing sealing jaws on one and heat sealing jaws on the other respectively. Then a further cam element needs to be connected to other driving means to enable position control also for the clamping and sealing operation to take place in a perpendicular direction as discussed in the foregoing. For reasons of clarity only one part of the fixed housing is illustrated but actually there should be four similar parts, of which two carry driving means, for driving each a cam element

[0039] If a folding ruler is prolonged, this means that just before clamping and sealing the material web has to travel a longer distance, and when the clamping action is activated, it should also be maintained until the subsequent pair of cooperating sealing jaws, which e.g. act in a perpendicular direction, actually clamp (and seal) the web.

[0040] Thus, a continuous and automatical control of the position as for as serving means are connected is obtained and the path of the package material web is adjusted continuously through controlling the length of the folding rulers.

[0041] The invention is of course not limited to the particularly illustrated embodiments but it can be varied in a number of ways within the scope of the appended claims. Particularly any kind of a appropriate driving means may be used as well as any appropriate kind of detecting means. Moreover, how the detection is performed can be provided for in different manners. Markings can be provided for the purposes of being detected only or for the purpose of position controlling only, or alternatively already existing serving means that anyhow should have been provided, can be used etc. The inventive concept is also applicable to production of different kinds of packages such as brick shaped packages, tetrahedrally shaped packages etc.

Claims

1. A packaging machine (100) for packaging pourable food products, comprising means for longitudinally sealing a web (101) of continuous packaging material to form a tube, a number of pairwise cooperating sealing jaws (1, 1'; 10) for clamping and sealing the product filled tube at regularly spaced intervals; and position controlling means (40, 20; 400, 20), whereby the position controlling means (40, 20; 400, 20) com-

prises means for automatically adjusting the length of the path of the packaging material web (101) before transversal clamping and sealing such that the position of serving means provided on the material web can be controlled to have a predetermined position on finished, sealed packages, the position controlling means (40, 20; 400, 20) further being arranged to act upstream of the respective sealing jaws (1, 1', 10), **characterized in that** the position controlling means comprises:

- one folding ruler (20) for each pair of sealing jaws (1, 1'; 10), said folding ruler (20) having a ruler part (21) for acting on the web (101); and
- actuating means (40; 400) operable to adjust the position of the ruler part (21) of said folding ruler (20) thus adjusting the length of the path the web (101) travels before clamping/sealing transversally.

2. A machine according to claim 1, **characterized in that**, in each pair of sealing jaws (1, 1'; 10), the relative folding ruler (20) is slidably mounted with respect to one of said sealing jaws (1, 1'; 10).
3. A machine according to claim 2, **characterized in that** the folding ruler (20) comprises a ruler part (21) for acting on the material web (101) and a rear part (22) on which is actuated to slidably move the folding ruler (20) with respect to the sealing jaw (10) in which it is mounted.
4. A machine according to claim 3, **characterized in that** retaining means (25) are connected to the folding ruler (20) associated with the sealing jaw (10).
5. A machine according to claim 4, **characterized in that** the retaining means (25) are spring (23) biased towards the folding ruler and on the opposite end carries a rotatable ball bearing (26).
6. A machine according to claim 5, **characterized in that** the actuating means comprises a pivotably mounted cam element (60; 420) actuating on the ball bearing (26) and a driving means (41; 410) controlling the cam element (60; 420).
7. A machine according to claim 6, **characterized in that** the driving means comprises an air cylinder arrangement (41) driving a link system (65) connected to the cam element.
8. A machine according to claim 7, **characterized in that** the air cylinder arrangement (41) comprises three air cylinders connected in series with cylinder strokes of 2 mm, 1 mm and 0,5 mm respectively such that the folding ruler (20) can be controlled to take any of seven different positions with respect to the

sealing jaw (10) in which it is mounted.

9. A machine according to claim 6, **characterized in that** the driving means comprises a stepping motor (410).
10. A machine according to any one of the preceding claims, **characterized in that** the web (101) is provided with equidistantly spaced markings.
11. A machine according to claim 10, **characterized in that** the position controlling means further comprises detecting means (105) for detecting the position of the makings or serving means and **in that** said detecting means (105) is connected to a control unit (107) controlling the actuating means.
12. A machine according to any one of the preceding claims, **characterized in that** the serving means comprises design patterns and **in that** the position controlling means comprises design correction means.
13. A machine according to any one of the preceding claims, **characterized in that** the serving means are straw holes, perforations, e.g. perforated corners etc.
14. A machine according to any one of the preceding claims, **characterized in that** the sealing jaws are arranged on endless chains such that in operation consecutive seals are provided which form an angle of substantially 90° with respect to each other such that tetrahedrally-shaped packages are produced.
15. A method of position controlling in a packaging machine for packaging pourable food products including the steps of:
 - feeding a continuous web of packaging material,
 - forming the web into a tube,
 - sealing the tube longitudinally,
 - filling the tube with a pourable food product,
 - detecting equidistantly provided markings or serving means on the web,
 - when establishing deviations in position of the markings in relation to predetermined positions,
 - determining in a control unit, based on the detection of markings/serving means if and/or how the path the web travels need to be adjusted,**characterized in that** it further comprises the steps of:
 - automatically adjusting the distance the web travels before performing a transversal clamping/sealing operation by a pair of sealing jaws

to form a separate package, by
 - activating actuation means acting on one folding ruler displaceably mounted with respect to one of the sealing jaws to adjust its position thus adjusting the path length of the material web before clamping/sealing transversally.

16. The method of claim 15, **characterized in that** the folding ruler is slidably mounted in the sealing jaw.
17. The method of claim 15 or 16, **characterized in that** it includes the step of driving the actuating means using a stepping motor, an air cylinder arrangement or similar.
18. The method of any one of claims 15-17, **characterized in that** the serving means comprise design patterns, straw holes, perforations or similar.
19. The method of claim 15, 16 or 17, **characterized in that** it comprises the step of acting on a ball bearing connected to the folding ruler which ball bearing contacts a cam surface of the actuating means.

Patentansprüche

1. Verpackungsmaschine (100) zum Verpacken von schütt- bzw. fließfähigen Nahrungsmittelprodukten, umfassend Mittel zum Längssiegeln einer Bahn (101) aus kontinuierlichem Verpackungsmaterial, um einen Schlauch zu bilden, eine Anzahl paarweise zusammenwirkender Siegelungsbacken (1, 1'; 10), um den mit dem Produkt befüllten Schlauch in regelmäßigen Abständen einzuspannen bzw. -klemmen und zu (ver)siegeln, und Positionsteuermittel (40, 20; 400, 20), wobei die Positionsteuermittel (40, 20; 400, 20) Mittel zum automatischen Anpassen der Länge des Pfads der Verpackungsmaterialbahn (101) umfassen, bevor das seitliche Einklemmen und Siegeln erfolgt, so dass die Position von Darreichungsmitteln, die auf der Materialbahn vorgesehen sind, so gesteuert werden kann, dass diese eine vorbestimmte Position auf den fertigen, versiegelten Verpackungen einnehmen, wobei die Positionssteuermittel (40, 20; 400, 20) ferner angeordnet sind, um oberhalb der bzw. den entsprechenden Siegelbacken (1, 1', 10) vorgelagert einzuwirken, **dadurch gekennzeichnet, dass** die Positionssteuermittel umfassen:
- einen Faltmaßstab bzw. Zollstock (20) für jedes Paar Siegelungsbacken (1, 1'; 10), wobei der Faltmaßstab (20) einen Maßstabsteil (21) zum Einwirken auf die Bahn (101) hat; und
 - Betätigungsmittel (40; 400), die bedient werden, um die Position des Maßstabsteils (21) des Maßstabs (20) einzustellen, wodurch die Länge

des Pfads eingestellt wird, den die Bahn (101) vor dem Querklemmen/-siegeln entlangläuft.

2. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** in jedem Paar Siegelungsbacken (1, 1'; 10) der jeweilige Maßstab (20) in Bezug auf eine der Siegelungsbacken (1, 1'; 10) verschiebbar befestigt ist.
3. Maschine nach Anspruch 2, **dadurch gekennzeichnet, dass** der Maßstab (20) einen Maßstabsteil (21) zum Einwirken auf die Materialbahn (101) umfasst und einen hinteren Teil (22), der betätigt wird, um den Maßstab (20) in Bezug auf die Siegelungsbacke (10), in der er befestigt ist, verschiebbar zu bewegen.
4. Maschine nach Anspruch 3, **dadurch gekennzeichnet, dass** die (Rück)Haltemittel (25) mit dem Maßstab (20), der mit der Siegelungsbacke (10) zusammenhängt, verbunden sind.
5. Maschine nach Anspruch 4, **dadurch gekennzeichnet, dass** die Rückhaltemittel (25) gegen den Maßstab mit Feder (23) vorgespannt sind und auf dem gegenüberliegenden Ende ein drehbares Kugellager (26) tragen.
6. Maschine nach Anspruch 5, **dadurch gekennzeichnet, dass** die Betätigungsmittel ein schwenk- bzw. drehbares Nockenelement (60; 420), welches auf das Kugellager (26) einwirkt, und Antriebsmittel (41; 410), die das Nockenelement (60; 420) steuern, umfassen.
7. Maschine nach Anspruch 6, **dadurch gekennzeichnet, dass** die Antriebsmittel eine Luftzylinderanordnung (41) umfassen, die ein mit dem Nockenelement verbundenes Verbindungs- bzw. Gliedersystem (65) antreiben.
8. Maschine nach Anspruch 7, **dadurch gekennzeichnet, dass** die Luftzylinderanordnung (41) drei Luftzylinder umfasst, die mit Zylinderhüben von jeweils 2 mm, 1 mm und 0,5 mm in Serie angeordnet sind, so dass der Maßstab (20) so gesteuert werden kann, dass er jedwede von sieben unterschiedlichen Positionen in Bezug auf die Siegelungsbacke (10), in der er befestigt ist, einnimmt.
9. Maschine nach Anspruch 6, **dadurch gekennzeichnet, dass** die Antriebsmittel einen Schrittmotor (410) umfassen.
10. Maschine nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Bahn (101) mit gleich beabstandeten Markierungen versehen ist.

11. Maschine nach Anspruch 10, **dadurch gekennzeichnet, dass** die Positionsteuermittel ferner Erfassungsmittel (105) zum Erfassen der Position der Markierungen oder Darreichungsmittel umfassen, und dass die Erfassungsmittel (105) mit einer Steuerungseinheit (107) zum Steuern der Betätigungsmittel verbunden sind. 5
12. Maschine nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Darreichungsmittel Design- bzw. Entwurfsmuster umfassen, und dass die Positionsteuermittel Designkorrekturmittel umfassen. 10
13. Maschine nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Darreichungsmittel Trinkhalm Löcher, Perforierungen, z.B. perforierte Ecken usw. sind. 15
14. Maschine nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Siegelungsbacken auf Endlosketten angeordnet sind, so dass im Betrieb aufeinanderfolgende Siegelungen erfolgen, die einen Winkel von im Wesentlichen 90° in Bezug zueinander bilden, so dass tetraederförmige Verpackungen hergestellt werden. 20 25
15. Verfahren zur Positionssteuerung in einer Verpackungsmaschine zum Verpacken von schütt- bzw. fließfähigen Nahrungsmittelprodukten, enthaltend die Schritte: 30
- Zuführen einer kontinuierlichen Bahn aus Verpackungsmaterial,
 - Formen der Bahn zu einem Schlauch,
 - Längssiegeln des Schlauchs,
 - Befüllen des Schlauchs mit einem schütt- bzw. fließfähigen Nahrungsmittelprodukt,
 - Erfassen gleich beabstandet vorgesehener Markierungen oder Darreichungsmittel auf der Bahn,
 - bei Feststellen von Abweichungen in der Position der Markierungen in Bezug auf die vorbestimmten Positionen,
 - Bestimmen in einer Steuereinheit, basierend auf der Erfassung von Markierungen/Darreichungsmitteln, ob und/oder wie der Pfad, den die Bahn entlangläuft, angepasst werden muss,
- dadurch gekennzeichnet, dass** es ferner die Schritte umfasst: 50
- automatisches Anpassen der Entfernung bzw. Strecke, die die Bahn entlangläuft, bevor ein Querklemm-/siegelungsvorgang durch ein Paar Siegelungsbacken durchgeführt wird, um eine separate Packung zu bilden, durch
 - in Betrieb setzen bzw. Aktivieren der Antriebs-

mittel, die auf einen Maßstab einwirken, der verschiebbar in Bezug auf eine der Siegelungsbacken befestigt ist, um deren Position anzupassen, wodurch die Pfadlänge der Materialbahn vor dem Querklemmen/-siegeln angepasst wird.

16. Verfahren nach Anspruch 15, **dadurch gekennzeichnet, dass** der Maßstab verschiebbar in der Siegelungsbacke befestigt ist.
17. Verfahren nach Anspruch 15 oder 16, **dadurch gekennzeichnet, dass** es den Schritt des Antreibens bzw. Fahrens der Betätigungsmittel unter Verwendung eines Schrittmotor, einer Luftzylinderanordnung oder ähnlichem enthält.
18. Verfahren nach einem der Ansprüche 15-17, **dadurch gekennzeichnet, dass** die Darreichungsmittel Designmuster, Trinkhalm Löcher, Perforierungen oder ähnliches umfassen.
19. Verfahren nach Anspruch 15, 16 oder 17, **dadurch gekennzeichnet, dass** es den Schritt des Einwirkens auf ein Kugellager, das mit dem Maßstab verbunden ist, umfasst, wobei das Kugellager eine Nockenfläche der Betätigungsmittel berührt.

Revendications

1. Machine d'emballage (100) pour emballer des produits alimentaires fluides, comprenant des moyens pour souder longitudinalement une bande (101) de matériau d'emballage continu de façon à former un tube, un certain nombre de mâchoires de soudage coopérantes en paires (1, 1'; 10) pour serrer et souder le tube rempli de produit à intervalles régulièrement espacés, et des moyens de réglage de position (40, 20 ; 400, 20), et les moyens de réglage de position (40, 20 ; 400, 20) comprennent des moyens de réglage automatique de la longueur du chemin de la bande de matériau d'emballage (101) avant le serrage et le soudage transversaux de sorte que la position d'accessoires prévus sur la bande de matériau peut être réglée de manière à avoir une position prédéterminée sur les emballages soudés finis, les moyens de réglage de position (40, 20 ; 400, 20) étant en outre agencés pour agir en amont des mâchoires de soudage respectives (1, 1', 10), **caractérisée en ce que** les moyens de réglage de position comprennent :
- un dispositif de règle de pliage (20) pour chaque paire de mâchoires de soudage (1, 1'; 10), le dit dispositif de règle de pliage (20) ayant un élément de règle (21) pour agir sur la bande (101) ; et

- des moyens de manoeuvre (40 ; 400) qui agissent pour régler la position de l'élément de règle (21) du dit dispositif de règle de pliage (20) afin de régler la longueur du chemin de déplacement de la bande (101) avant le serrage / le soudage transversalement.
2. Machine selon la revendication 1, **caractérisée en ce que**, dans chaque paire de mâchoires de soudage (1, 1' ; 10), le dispositif de pliage associé (20) est monté de façon coulissante par rapport à une des dites mâchoires de soudage (1, 1' ; 10).
 3. Machine selon la revendication 2, **caractérisée en ce que** le dispositif de règle de pliage (20) comprend un élément de règle (21) pour agir sur la bande de matériau (101), et une partie arrière (22) sur laquelle on agit pour déplacer de façon coulissante le dispositif de règle de pliage (20) par rapport à la mâchoire de soudage (10) dans laquelle il est monté.
 4. Machine selon la revendication 3, **caractérisée en ce que** des moyens de retenue (25) sont connectés au dispositif de règle de pliage (20) associé à la mâchoire de soudage (10).
 5. Machine selon la revendication 4, **caractérisée en ce que** les moyens de retenue (25) sont rappelés par un ressort (23) vers le dispositif de règle de pliage et portent, sur l'extrémité opposée, un roulement à billes rotatif (26).
 6. Machine selon la revendication 5, **caractérisée en ce que** les moyens de manoeuvre comprennent un élément de came monté de façon pivotante (60 ; 420) agissant sur le roulement à billes (26), et un moyen d'entraînement (41, 410) qui commande l'élément de came (60 ; 420).
 7. Machine selon la revendication 6, **caractérisée en ce que** le moyen d'entraînement comprend un dispositif de vérin pneumatique (41) entraînant une transmission (65) connectée à l'élément de came.
 8. Machine selon la revendication 7, **caractérisée en ce que** le dispositif de vérin pneumatique (41) comprend trois vérins pneumatiques connectés en série, ayant des courses de vérin de 2 mm, 1 mm et 0,5 mm respectivement, de sorte que le dispositif de règle de pliage (20) peut être commandé pour prendre une quelconque de sept positions différentes par rapport à la mâchoire de soudage (10) dans laquelle il est monté.
 9. Machine selon la revendication 6, **caractérisée en ce que** le moyen d'entraînement comprend un moteur pas à pas (410).
 10. Machine selon une quelconque des revendications précédentes, **caractérisée en ce que** la bande (101) comporte des repères équidistants.
 11. Machine selon la revendication 10, **caractérisée en ce que** les moyens de commande de position comprennent en outre des moyens de détection (105) pour détecter la position des repères ou des accessoires et **en ce que** les dits moyens de détection (105) sont connectés à une unité de commande (107) commandant les moyens de manoeuvre.
 12. Machine selon une quelconque des revendications précédentes, **caractérisée en ce que** les accessoires comprennent des configurations de conception et **en ce que** les moyens de commande de position comprennent des moyens de correction de conception.
 13. Machine selon une quelconque des revendications précédentes, **caractérisée en ce que** les accessoires sont des trous de paille, des perforations, par exemple des angles perforés, etc.
 14. Machine selon une quelconque des revendications précédentes, **caractérisée en ce que** les mâchoires de soudage sont agencées sur des chaînes sans fin de sorte que, en fonctionnement, des soudures consécutives sont effectuées et forment un angle sensiblement de 90° les unes par rapport aux autres, de manière à produire des emballages tétraédriques.
 15. Procédé de réglage de position dans une machine d'emballage pour emballer des produits alimentaires fluides, comprenant les étapes de :
 - distribution d'une bande continue de matériau d'emballage,
 - formage de la bande en un tube,
 - soudage du tube longitudinalement,
 - remplissage du tube avec un produit alimentaire fluide,
 - détection de repères équidistants ou d'accessoires sur la bande,
 - lors de l'apparition d'écarts de position des repères par rapport à des positions prédéterminées,
 - détermination dans une unité de commande, sur la base de la détection des repères / accessoires, si et/ou comment le chemin de déplacement de la bande doit être ajusté,
- caractérisé en ce qu'il** comprend en outre les étapes de :
- réglage automatique de la distance dont la bande se déplace avant d'effectuer une opération de serrage / soudage transversal par une paire

de mâchoires de soudage pour former un emballage séparé, par

- activation de moyens de manoeuvre agissant sur un dispositif de règle de pliage monté de façon déplaçable par rapport à une des mâchoires de soudage afin d'ajuster sa position et ajuster ainsi la longueur du chemin de la bande de matériau avant le serrage / soudage transversal. 5

16. Procédé selon la revendication 15, **caractérisé en ce que** le dispositif de règle de pliage est monté de façon coulissante dans la mâchoire de soudage. 10

17. Procédé selon la revendication 15 ou 16, **caractérisé en ce qu'il** comprend l'étape d'entraînement des moyens de manoeuvre par un moteur pas à pas, un dispositif de vérin pneumatique ou similaire. 15

18. Procédé selon une quelconque des revendications 15 à 17, **caractérisé en ce que** les accessoires comprennent des configurations de conception, des trous de paille, des perforations ou similaires. 20

19. Procédé selon la revendication 15, 16 ou 17, **caractérisé en ce qu'il** comprend l'étape d'action sur un roulement à billes connecté au dispositif de règle de pliage, le dit roulement à billes étant en contact avec une surface de came des moyens de manoeuvre. 25

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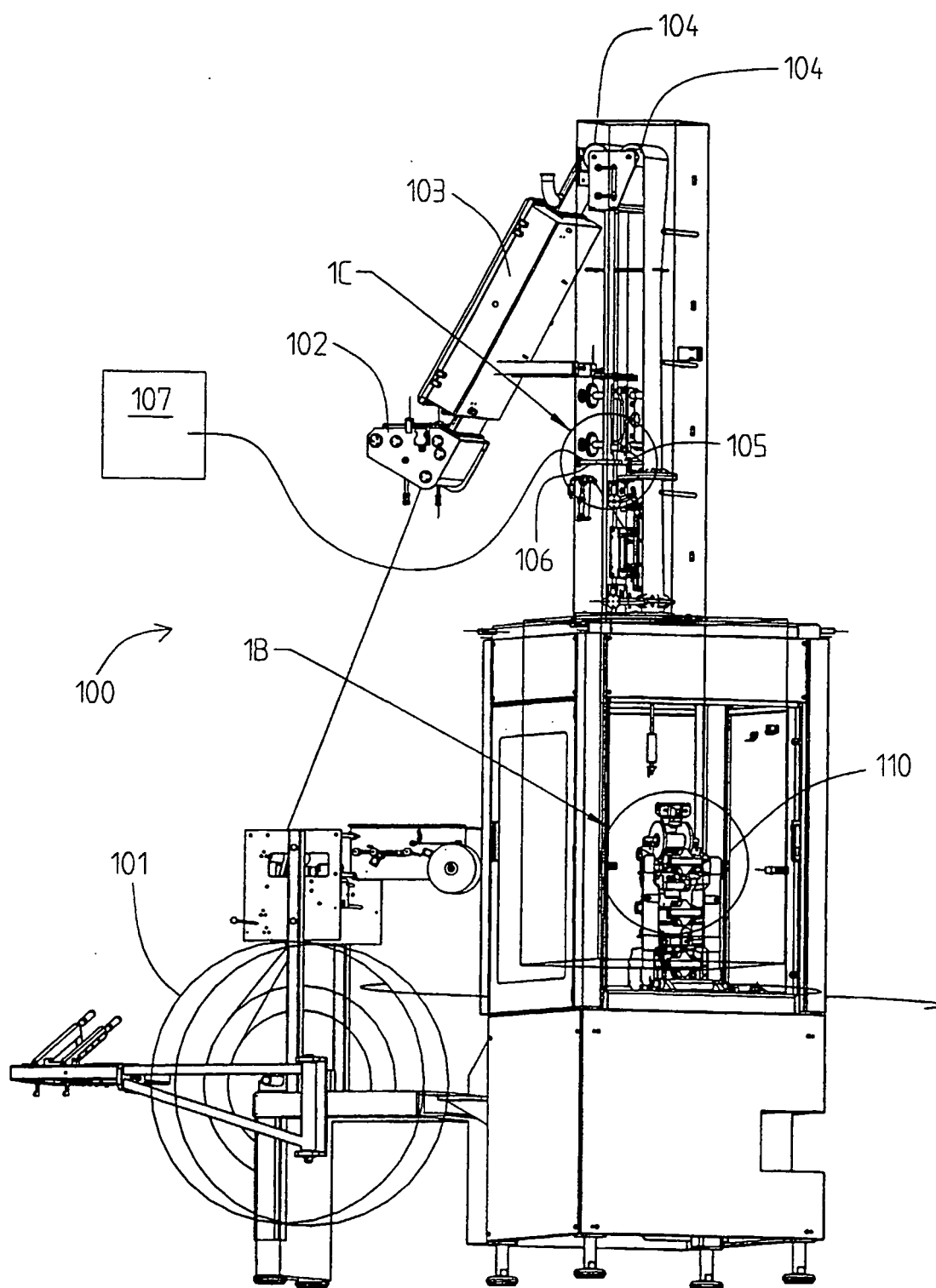


Fig. 1A

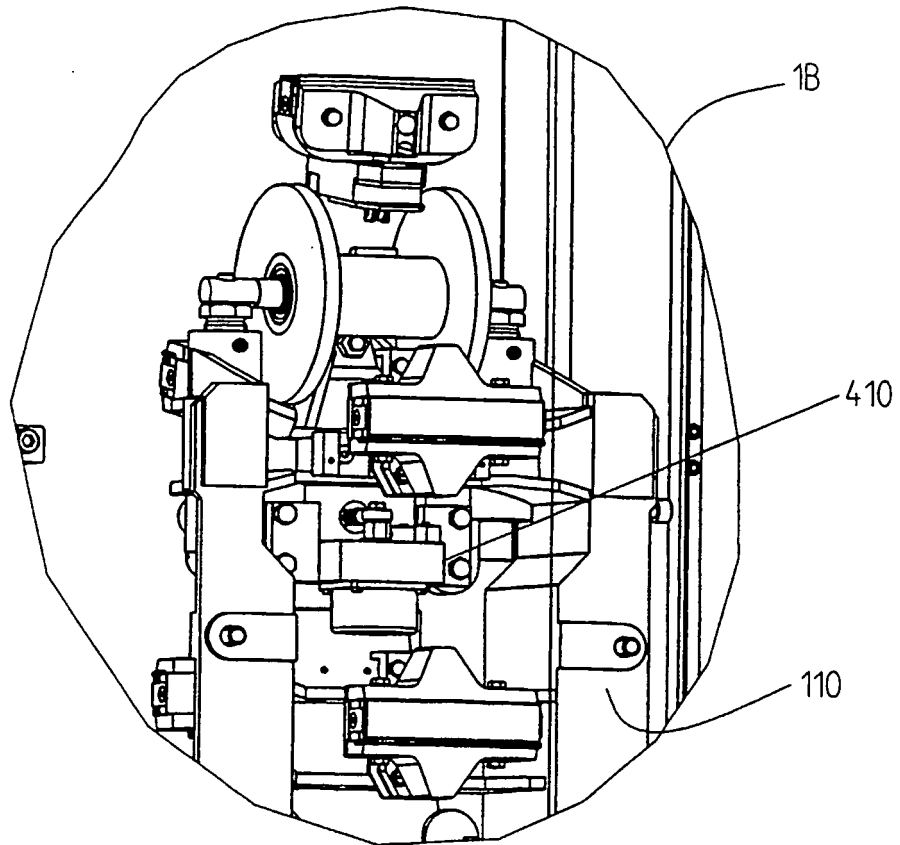


Fig. 1 B

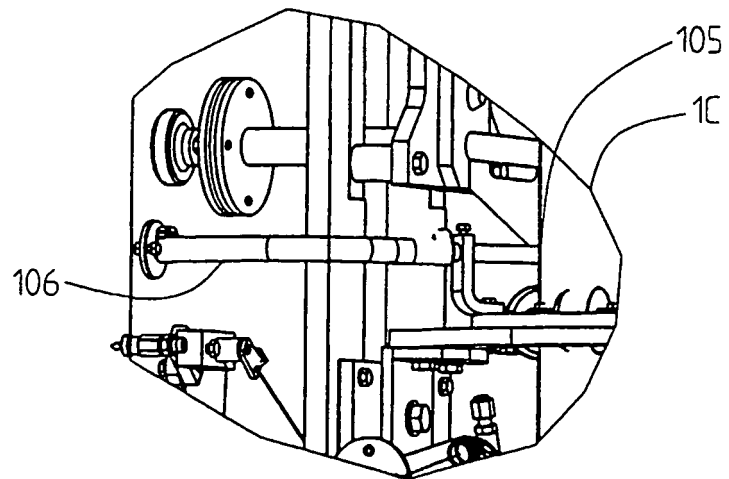


Fig. 1 C

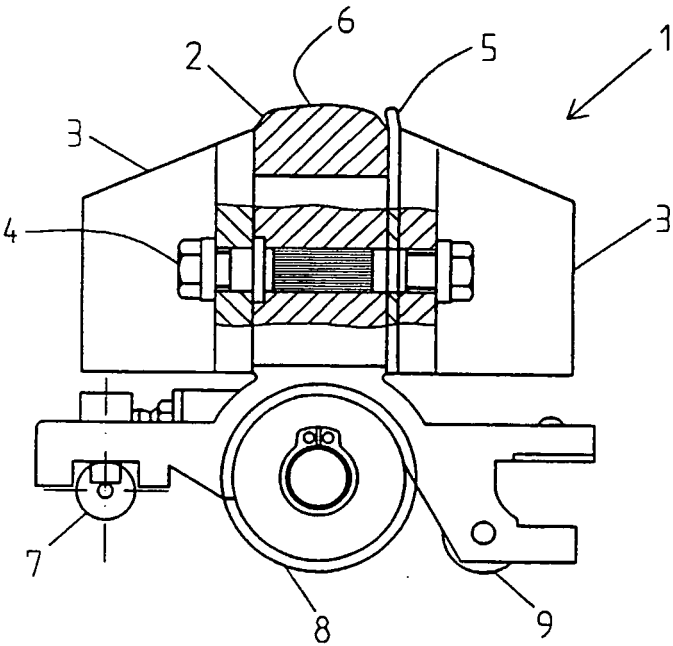


Fig. 2

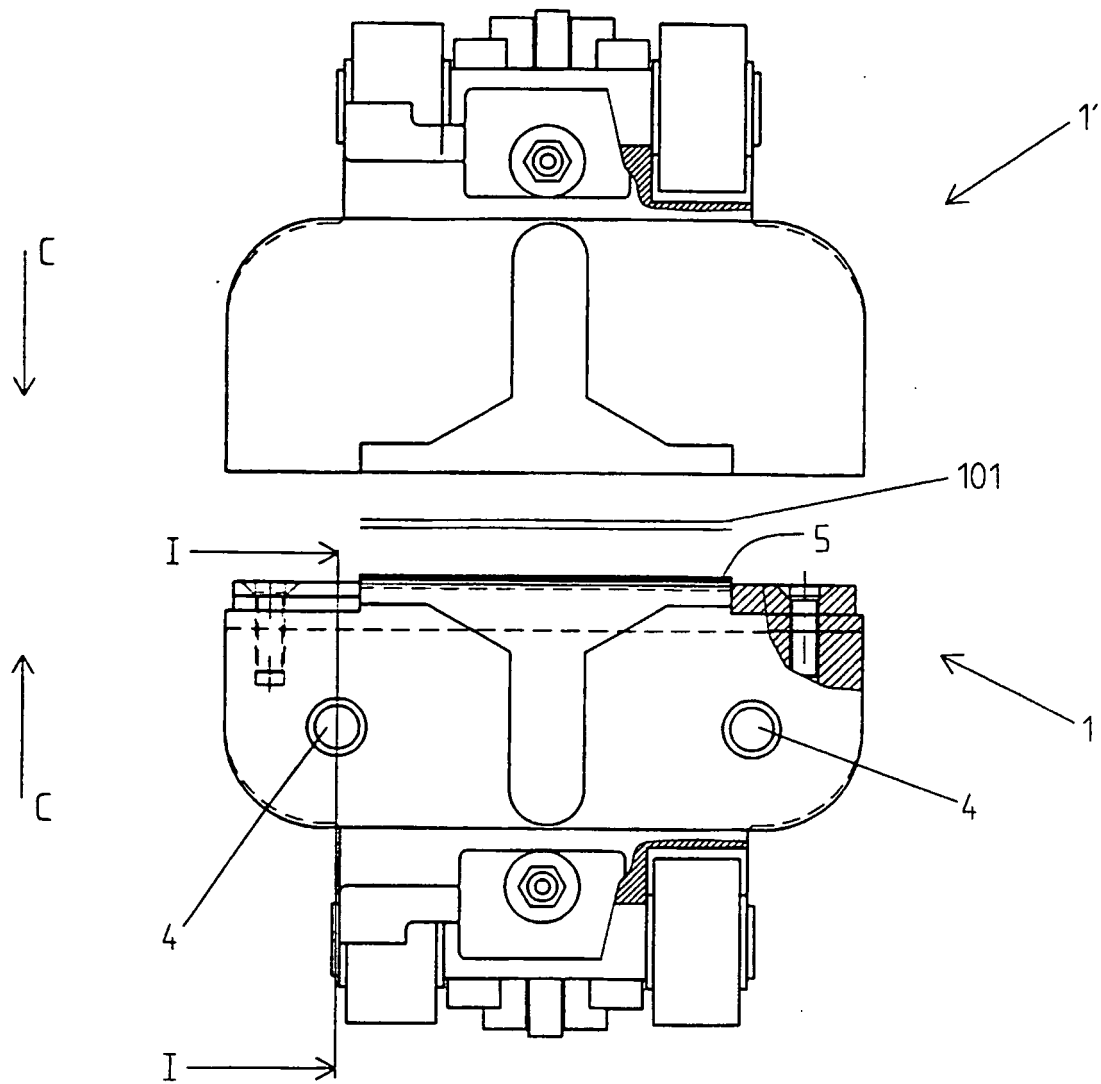


Fig. 3

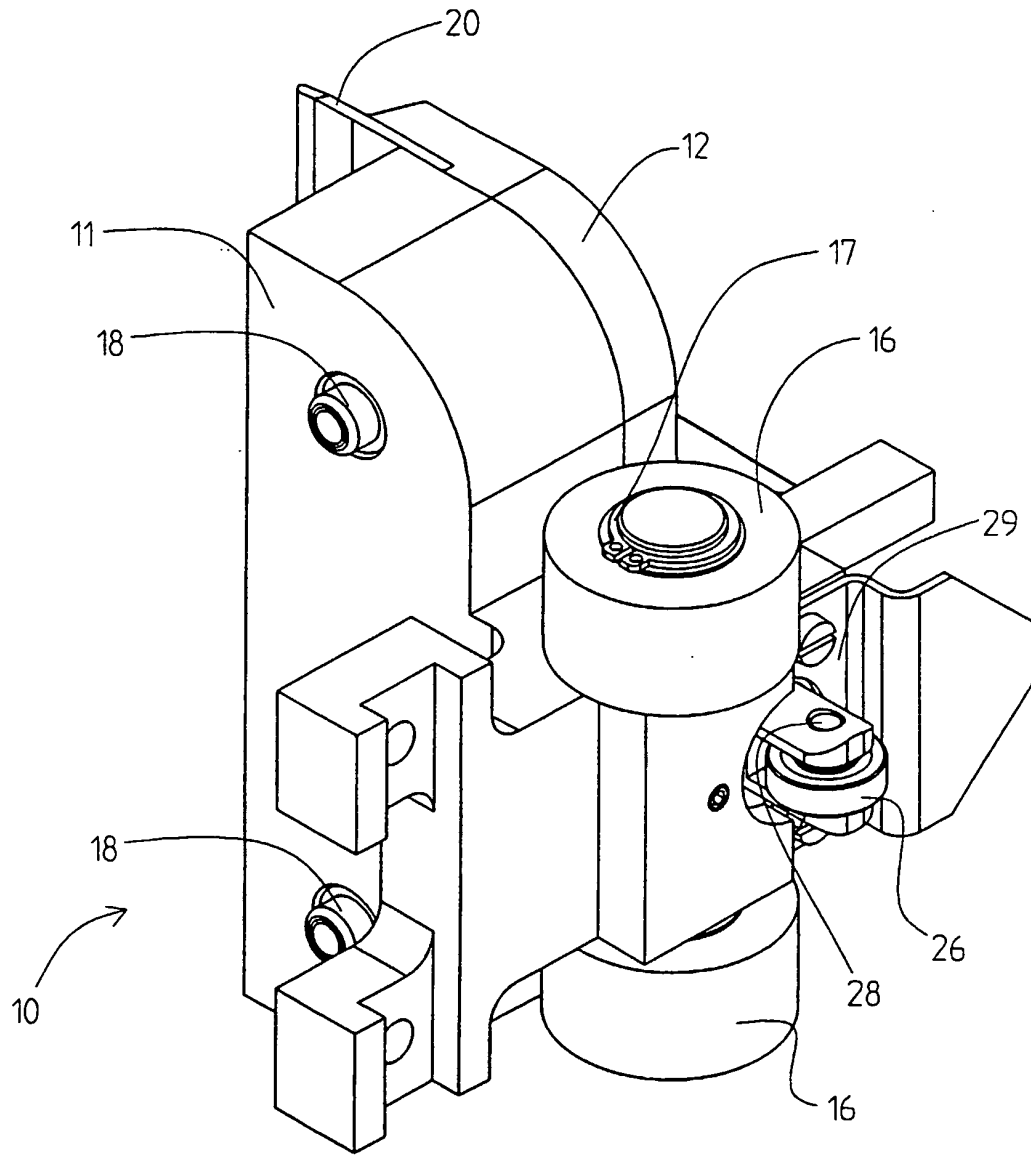


Fig. 4A

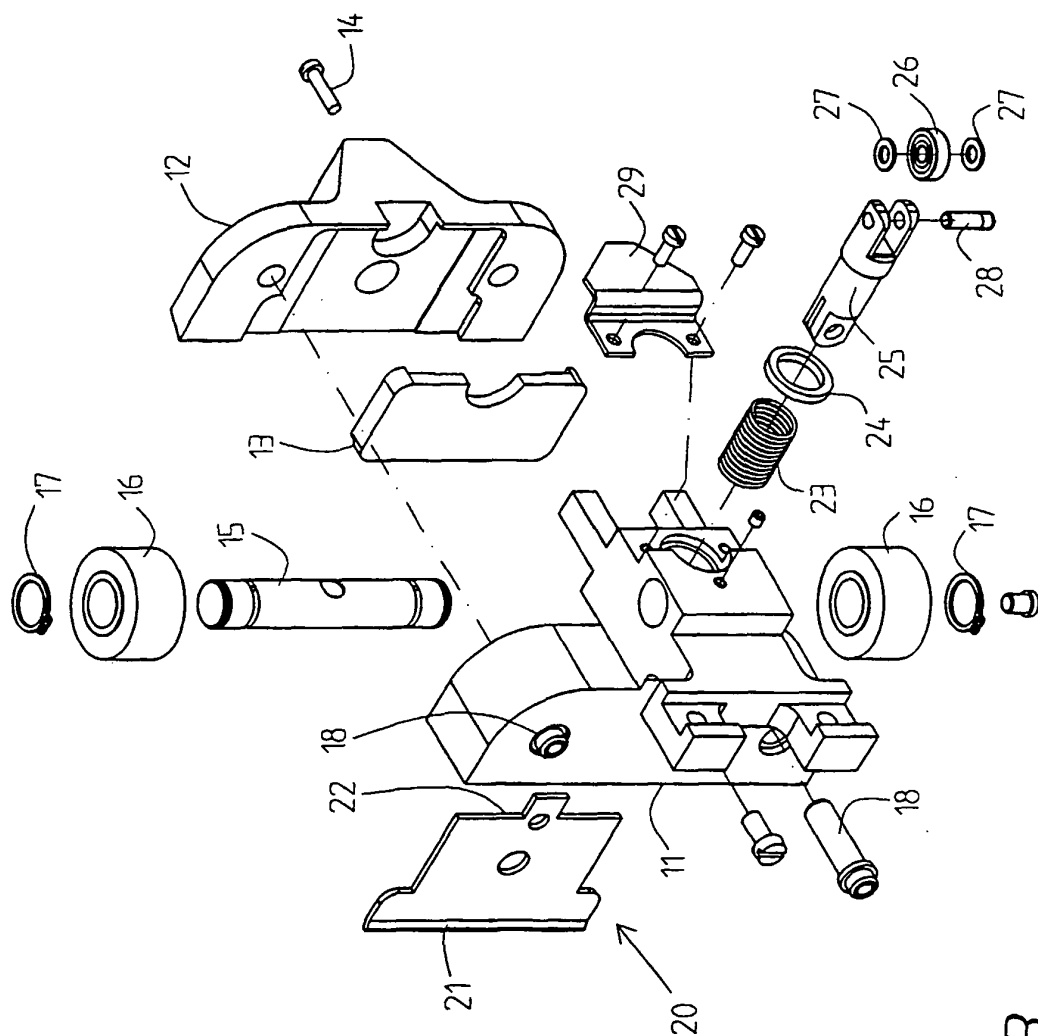


Fig. 4B

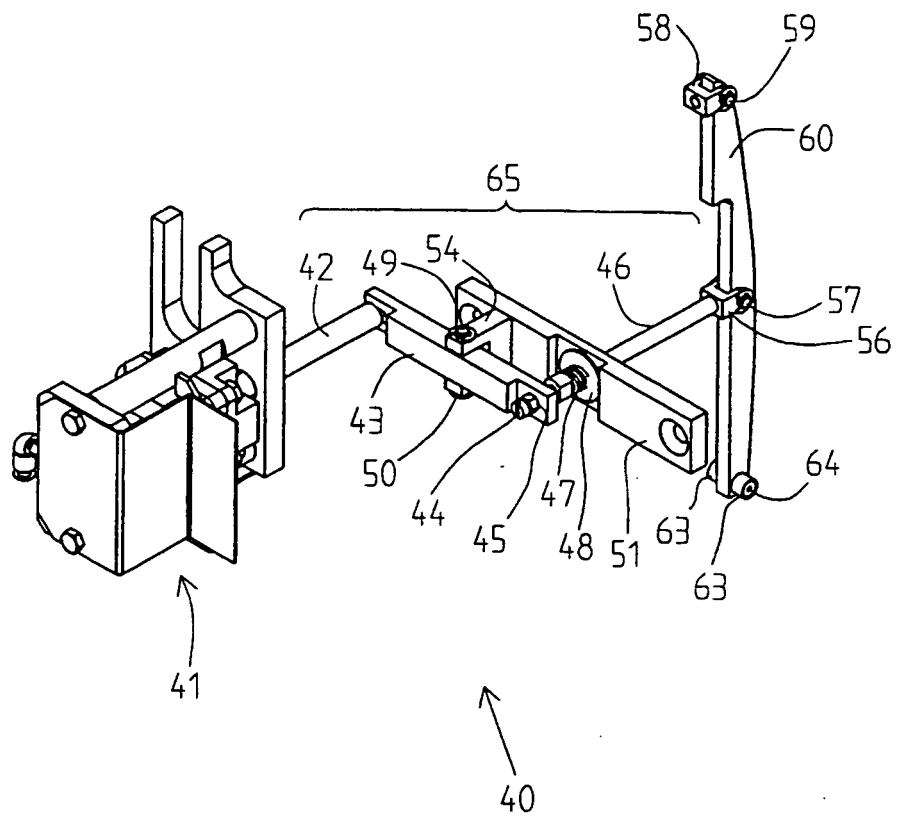


Fig. 5

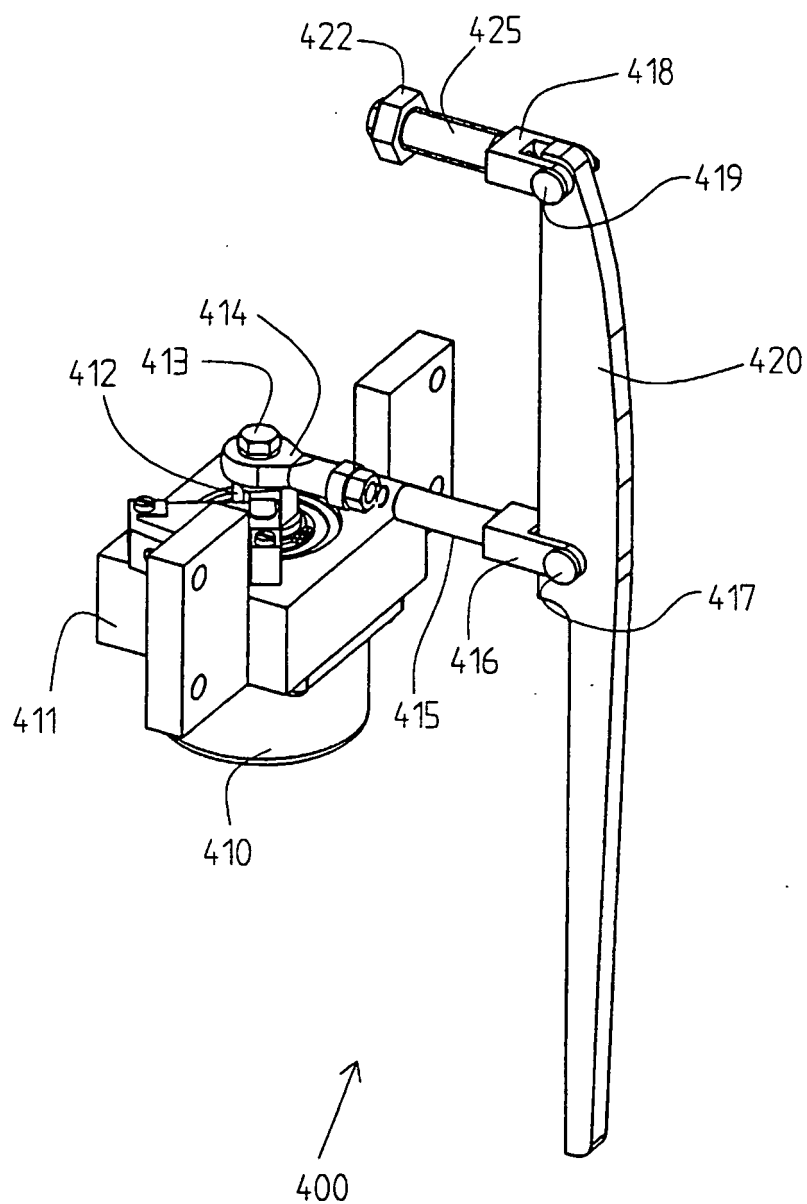


Fig. 6

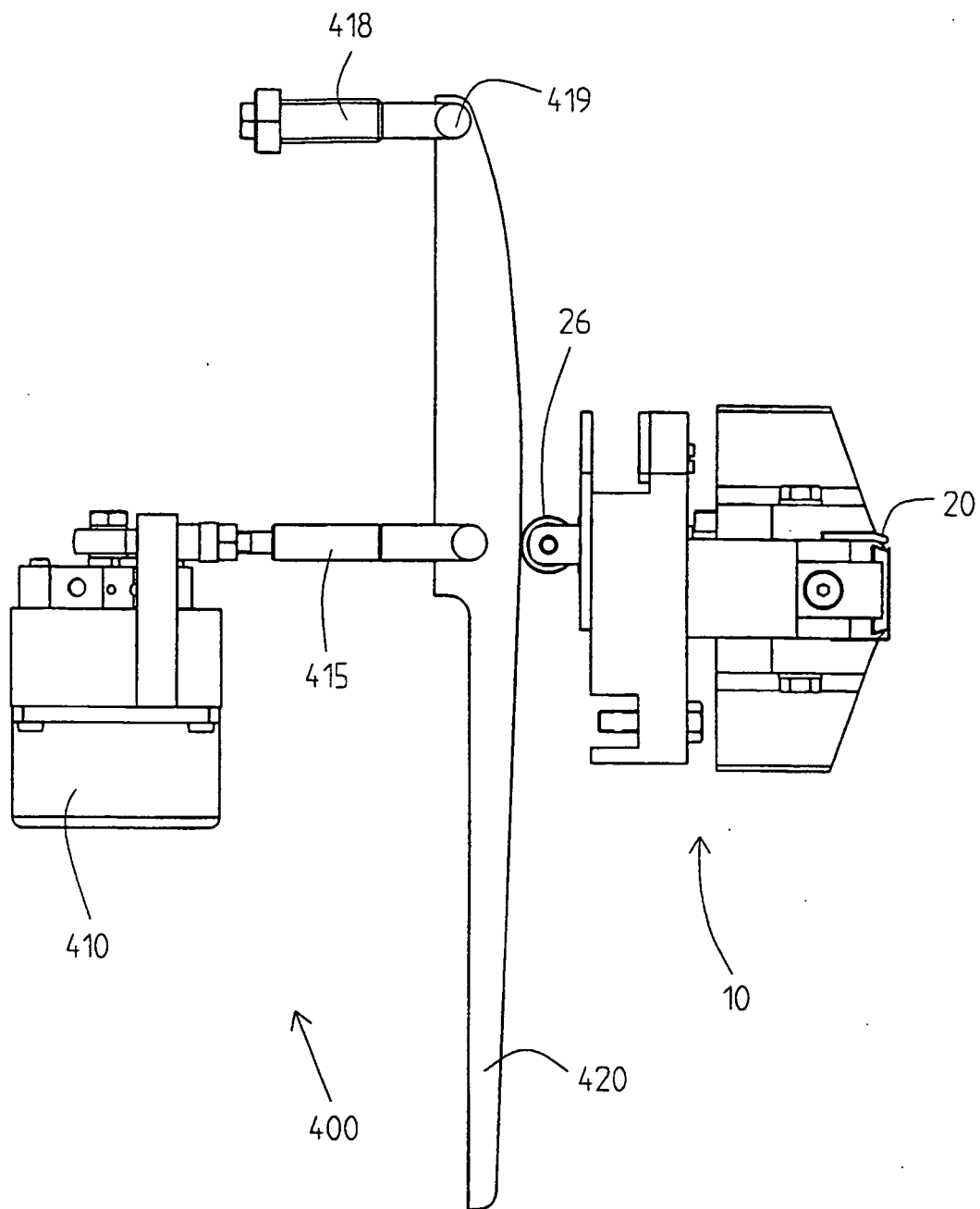


Fig. 7A

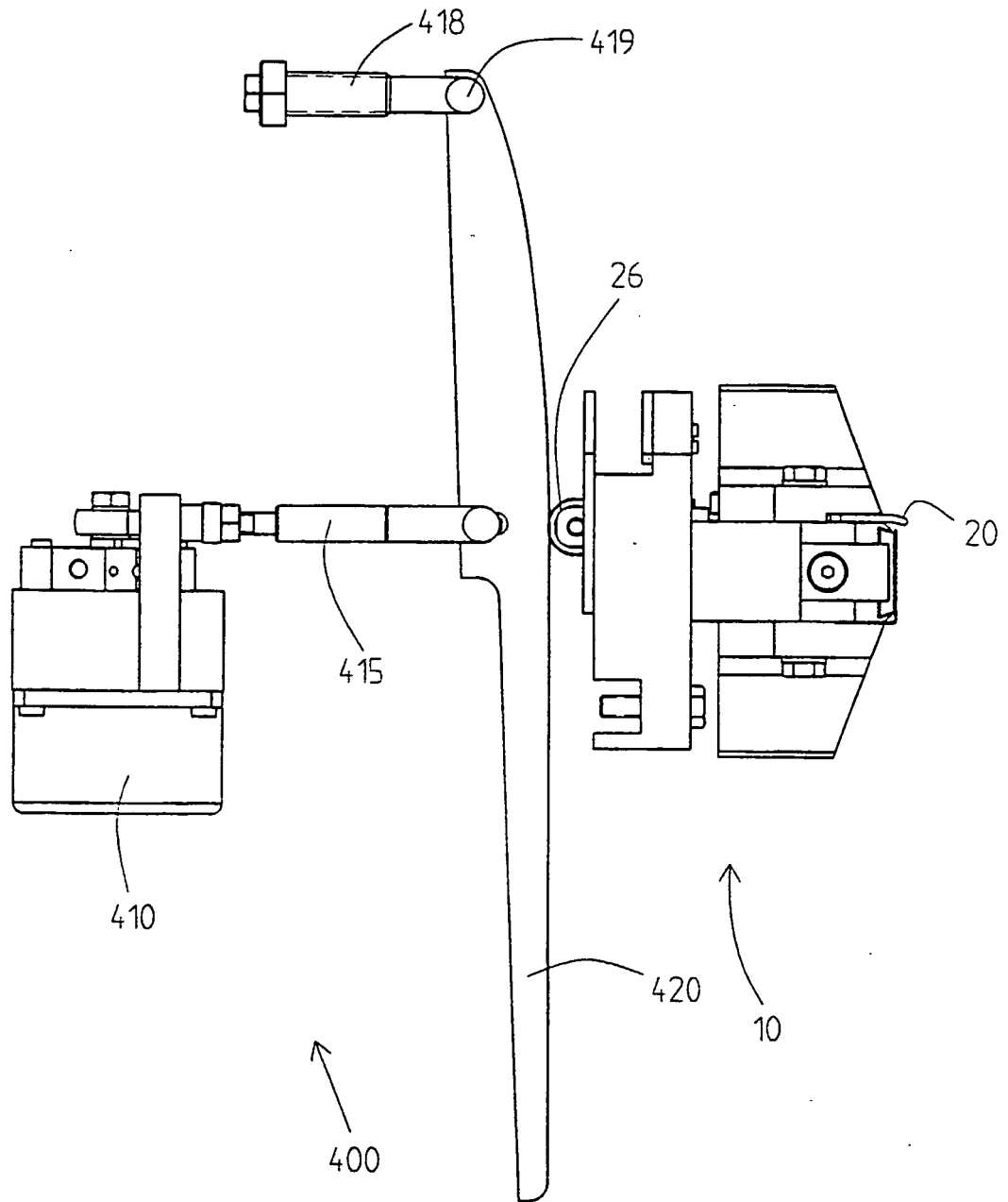


Fig. 7B

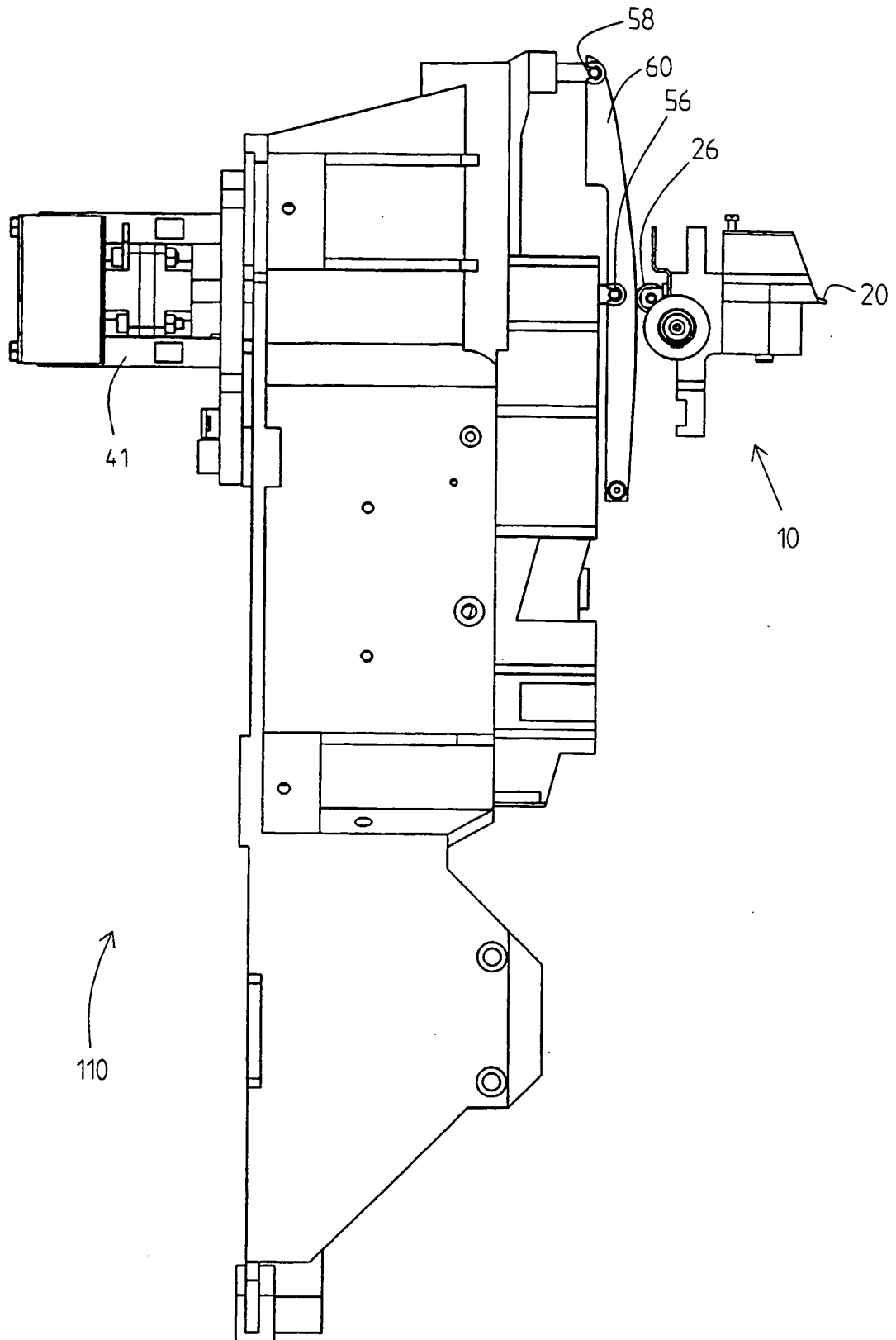


Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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