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DESCRIPTION

Technical Field

[0001] The present invention relates to a package-belt line drawing device that automatically draws a line on a package belt that separately encloses a medication, and a packaging machine including the package-belt line drawing device. Specifically, the present invention relates to a device that can hold multiple coloring tools to change the colors of drawn lines and that can switch between line drawing tools.

Background Art

[0002] A medication packaging machine that separately encloses tablets or powdered medications in a long package belt (see, for example, PTL 1) includes a package-belt transport mechanism, a medication inserting mechanism, a package-belt thermally sealing mechanism, and a package-belt traction mechanism along a transport path of the package belt to form separate packages as basic functions. Many of such medication packaging machines also include a printing mechanism facing the transport path of the package belt to print a patient's name or consumption information on each package.

[0003] Typical examples of printed consumption information include consumption timing such as morning, noon, evening, or night. Some of medication packaging machines including a printing mechanism have, besides a function of printing consumption timings with characters, a function of drawing colored lines with different colors for different consumption timings in addition to or instead of characters.

[0004] To assist pharmacists or others in manually drawing lines on a package belt using coloring tools such as color pens, some machines have a guideline, such as a groove, on, for example, a ruler or an engagement lid.

[0005] Such drawing of lines with different colors has high viewability, and thus is performed in pharmacies or hospitals to prevent erroneous consumption or for convenience purposes. An automatic line drawing operation using a medication packaging machine including a line drawing device, or so-called an automatic line drawing operation concurrently with packaging, and an operation of manually drawing lines on a package belt taken after being packaged by a medication packaging machine, or so-called a manual line drawing operation after packaging have both merits and demerits.

[0006] Specifically, the cost of equipment is smaller in the manual line drawing operation after packaging than in the automatic line drawing operation concurrently with packaging. In addition, flexibility is higher in the manual line drawing operation after packaging than in the

automatic line drawing operation concurrently with packaging, because the manual line drawing operation after packaging can be performed without any limitation in the case, for example, where drawing lines with different colors is requested immediately before or after a package belt is passed to, for example, a patient at the sickroom or a pharmacy or where a medication packaging machine capable of drawing lines is occupied or not in operation.

[0007] Efficiency, on the other hand, is overwhelmingly higher in the automatic line drawing operation concurrently with packaging than in the manual line drawing operation after packaging. Thus, personnel expenses are smaller in the automatic line drawing operation concurrently with packaging than in the manual line drawing operation after packaging.

[0008] The manual line drawing operation after packaging is inevitably performed when the automatic line drawing operation concurrently with packaging is impossible. However, as long as the automatic line drawing operation concurrently with packaging is possible, the automatic line drawing operation concurrently with packaging is usually preferentially performed by a package-belt line drawing device installed in a packaging machine.

[0009] Such a package-belt line drawing device for automatic line drawing concurrently with packaging is installed in a packaging machine together with a printing mechanism to face a transport path for a package belt, and draws lines synchronously with a longitudinal transportation of the package belt in the same manner as printing of the printing mechanism. Unlike printing of the printing mechanism, however, the package-belt line drawing device draws lines with different colors.

[0010] Such a package-belt line drawing device for automatic line drawing concurrently with packaging can have a structure including a writing-tool holding mechanism for holding multiple coloring tools and a writing-tool switching mechanism for switching between line drawing tools by moving, among those coloring tools, a writing tool used for drawing a line toward or away from the package belt. In a package-belt line drawing device formed by simply embodying these mechanisms with typical methods, however, the writing-tool holding mechanism merely holds multiple coloring tools arranged linearly and the writing-tool switching mechanisms merely move one of the coloring tools forward or rearward. Specifically, the above-described structure needs to include multiple writing-tool switching mechanisms corresponding to coloring-tool holding portions of the writing-tool holding mechanism.

Citation List

Patent Literature

[0011] PTL 1: Japanese Unexamined Patent Application Publication No. 2006-321516. WO 2014/076704 A1 shows the preamble of claim 1.

Summary of Invention

Technical Problem

[0012] As described above, medication consumption is usually performed at four timings of morning, noon, evening, and night. Thus, colors of lines drawn on package belts are desirably four or more.

[0013] As a matter of practicality, even in a minimum structure that includes multiple writing-tool switching mechanisms corresponding to coloring-tool holding portions of the writing-tool holding mechanism, the writing-tool holding mechanism holds four coloring tools. Similarly, the minimum structure also includes four writing-tool switching mechanisms that drive the portions forward or rearward or perform driving control of the portions.

[0014] Thus, a structure that merely includes multiple writing-tool switching mechanisms corresponding to the coloring-tool holding portions of the writing-tool holding mechanism is inevitably rendered more complex or larger in size.

[0015] However, regardless of whether a medication packaging machine including a package-belt line drawing device is a tablet packaging machine or a powder packaging machine, the package-belt line drawing device is installed inside a wrapping device installed at a lowermost portion of the medication packaging machine. This portion is narrow, as being located at the lowermost. Besides, this portion also holds components such as a transport mechanism, a winding mechanism, and a traction mechanism for a package roll or a package belt, and a printing mechanism, a dosing mechanism, and a thermally sealing mechanism. This portion thus has only a small empty space. The package-belt line drawing device having the above-described structure thus may cause an increase in size of the medication packaging machine to be installed in the medication packaging machine.

[0016] To avoid such an inconvenience, a size reduction of the package-belt line drawing device is important.

[0017] A simple modification of integrating the writing-tool switching mechanisms into one unit to move the entirety of the writing-tool holding mechanism forward and rearward, however, increases the size of a driving mechanism or a driving circuit and significantly cancels out the effect of the size reduction of the writing-tool switching mechanisms. Besides, what are moved forward and rearward is changed from one coloring tool and its holding portion, which form a small mass, to four or more coloring tools and the entirety of the writing-tool holding mechanism, which form a large mass. This structure thus has a limited speed for moving forward or rearward. Specifically, for example, the speed for drawing a dotted line may be reduced, and thus the packaging speed that depends on the package-belt transportation

speed may also be reduced, which causes another problem.

[0018] An object to this end is to achieve a package-belt line drawing device suitable for size reduction and includes a smaller number of writing-tool switching mechanisms, small enough and capable of moving only one coloring tool, than the number of coloring-tool holding portions of a writing-tool holding mechanism.

Solution to Problem

[0019] A package-belt line drawing device according to the present invention (solution 1) is made to solve the above problem and includes a holding mechanism that holds a plurality of writing tools, and a switching mechanism that moves any one of the writing tools forward to a line drawing position. The holding mechanism holds a rotator while allowing the rotator to move rotationally and holds the writing tools while allowing the writing tools to move forward and rearward. The rotator includes a plurality of holding portions that support the writing tools, respectively. The rotator circularly moves the holding portions with the rotational movement while urging the holding portions rearward. The switching mechanism includes a rotational driving mechanism and a straight advance driving mechanism. The rotational driving mechanism is engaged with the holding mechanism to rotationally move the rotator. The straight advance driving mechanism moves any of the holding portions positioned at an engagement position by the rotational movement forward to the line drawing position.

[0020] A package-belt line drawing device according to the present invention (solution 2) is the package-belt line drawing device according to the solution 1, wherein each of the holding portions holds a corresponding one of the writing tools while allowing the writing tool to be inserted therein or removed therefrom, and the switching mechanism supports the holding mechanism while allowing the holding mechanism to be attached thereto or detached therefrom.

[0021] A package-belt line drawing device according to the present invention (solution 3) is the package-belt line drawing device according to the solution 2, wherein the holding mechanism is attached to an upper portion of the switching mechanism, and the rotator and the rotational driving mechanism are engaged or disengaged by an attachment or removal of the holding mechanism to or from the switching mechanism.

[0022] A package-belt line drawing device according to the present invention (solution 4) is the package-belt line drawing device according to any of the solutions 1 to 3, wherein the straight advance driving mechanism includes an extruding member, a rotational member, and a circular movement portion. The extruding member is movable forward to and rearward from the engagement position. The extruding member moves the holding portion located at the engagement position forward by coming into contact with the holding portion when the straight advance driving mechanism moves forward. The rotational member is disposed separately from the rotator and rotates independently of the rotator. The circular movement portion is

disposed on the rotational member and circularly moves with a rotation of the rotational member. The circular movement portion and the extruding member are hinge-jointed to transform the circular motion of the circular movement portion into a reciprocative movement of the extruding member.

[0023] A medication packaging machine according to the present invention (solution 5 or 6) includes the package-belt line drawing device according to any one of the solutions 1 to 4, and a retreat prevention member disposed opposite the package-belt line drawing device with a package-belt transport path interposed therebetween. The retreat prevention member holds the package belt when the writing tool draws a line on the package belt to restrict the package belt from moving toward the retreat prevention member.

[0024] In a medication packaging machine according to the present invention, the package-belt retreat member of the medication packaging machine according to the solution 5 is attached to the switching mechanism below the package-belt transport path.

Advantageous Effects of Invention

[0025] The package-belt line drawing device according to the present invention (solution 1) includes a so-called resolver rotator including multiple holding portions as a main portion of the holding mechanism. In addition, all the holding portions that move forward to draw lines are urged rearward to hold the holding portions in a compact manner. In the package-belt line drawing device according to the solution 1, the switching mechanism includes a rotational driving mechanism and a straight advance driving mechanism. The rotational driving mechanism rotationally moves the rotator to circularly move the plurality of holding portions. The straight advance driving mechanism moves any of the holding portions positioned at an engagement position by the rotational movement forward. This structure including only one switching mechanism enables any holding portion and a writing tool attached to the holding portion to be used to draw lines.

[0026] The present invention may have a structure including a switching mechanism that moves only one coloring tool forward and rearward. In other words, this structure includes a smaller number of switching mechanisms than the number of holding portions of the writing tools in the holding mechanism, and is thus suitable to size reduction.

[0027] In the package-belt line drawing device according to the present invention (solution 2), each writing tool is allowed to be inserted into and held in the corresponding holding portion and removed from the holding portion. Thus, the holding mechanism is rendered more compact in size. In addition, the holding mechanism is rendered removable from the switching mechanism. Thus, each writing tool is inserted into and removed from the holding mechanism after the holding mechanism is taken out from the narrow space in the package-belt line drawing device to a wide space outside the device, which facilitates attachment or removal of the writing tool for replacement. This structure prevents undesirable situations where hands

are stained by a contact with the exposed tips of the writing tools and enables an easy and appropriate cleaning operation of the holding mechanism.

[0028] In the case where a spare holding mechanism is provided or multiple package-belt line drawing devices and multiple medication packaging machines are provided, a set of writing tools of different colors may be inserted into the holding mechanism in advance, so that the operation of collectively switching multiple colors at once can be easily and speedily performed with replacement of the holding mechanism.

[0029] In the package-belt line drawing device according to the present invention (solution 3), the holding mechanism and the switching mechanism are vertically arranged, so that the holding mechanism is attached and removed more easily.

[0030] To install the package-belt line drawing device next to the package-belt transport path of the medication packaging machine, the line drawing position of the writing tool is easily adjusted to the package belt. Thus, the entirety of the package-belt line drawing device can be rendered compact in size. This structure can easily find a space in the medication packaging machine for installing itself. In this embodiment, when the holding mechanism is attached to or removed from the switching mechanism, the engagement state and the transmission state between the rotator and the rotational driving mechanism are switched with the attachment or removal. This structure enables a speedy and simple attachment or removal of the writing-tool holding mechanism with a one-touch operation.

[0031] In the package-belt line drawing device according to the present invention (solution 4), the straight advance driving mechanism is disposed to be movable forward to and rearward from the engagement position. In this structure, when line drawing is required, a line can be drawn on the package belt by moving a writing tool to the engagement position. When line drawing is not required, a writing tool is moved away from the engagement position to easily omit line drawing.

[0032] In the package-belt line drawing device, the straight advance driving mechanism includes an extruding member that moves the holding portion located at the engagement position forward by coming into contact with the holding portion when the straight advance driving mechanism moves forward, a rotational member that is disposed separately from the rotator and that rotates independently of the rotator, and a circular movement portion that circularly moves with a rotation of the rotational member. When the rotational member is rotated, the position of the extruding member to which it moves forward or rearward changes depending on the rotation angle of the rotational member and the position in the circle of the circular movement portion, and thus the holding portion and the writing tool pressed by the extruding member also move forward or rearward to different positions. Thus, a line or a broken line can be drawn at a desired position of the package belt transported in the longitudinal direction by the rotation of the rotational member. To draw a broken line, the rotational member is simply continuously rotated to repeatedly move the extruding member and the writing tool at the engagement position forward and rearward. Thus, a solid line and a

broken line can be separately drawn with a relatively simple control.

[0033] In addition, the extruding member in a retracted state is spaced apart from the holding portion. This structure does not impair the workability when attaching or removing the holding mechanism to or from the switching mechanism.

[0034] The medication packaging machine according to the present invention (solution 5) includes a package-belt retreat prevention member disposed opposite the package-belt line drawing device with the package-belt transport path interposed therebetween to prevent the package belt from moving rearward. This structure completely or partially prevents excessive deformation of the package belt during line drawing. This structure enables drawing of neat lines on a package belt and smooth transportation of the package belt in the longitudinal direction.

[0035] In the medication packaging machine according to the present invention (solution 6), the package-belt retreat prevention member is attached to the switching mechanism below the package-belt transport path. Thus, the package-belt retreat prevention member and the writing-tool switching mechanism are integrated together without interfering with a package-belt setting operation in which the package belt is inserted into the transport path from above. Besides the above operation effect of preventing excessive deformation of the package belt, this structure allows an adjustment operation, such as positioning of the belt retreat prevention member with respect to the switching mechanism, to be performed in advance before being attached to the medication packaging machine, and easily performed in a wide space outside the medication packaging machine. Brief Description of Drawings

[0036]

[Fig. 1] Fig. 1 is a perspective view of an example of a structure of a package-belt line drawing device according to embodiment 1 of the present invention, viewed downward from the front left.

[Fig. 2] Fig. 2 is a perspective view of an example of a structure of a package-belt line drawing device according to embodiment 1 of the present invention, viewed downward from the rear left. The perspective view defines the line drawing side as the front, and the left and right as being viewed in the front view.

[Fig. 3] Fig. 3 is a perspective view of a structure of a package-belt line drawing device including a cover when viewed downward from the front left.

[Fig. 4] Fig. 4 is a perspective view of a structure of a package-belt line drawing device including a cover when viewed downward from the front right.

[Fig. 5] Fig. 5 is a perspective view of a structure of a holding mechanism when viewed downward from the front right.

[Fig. 6] Fig. 6 illustrates an arrangement of the mechanisms of a package-belt line drawing

device having the structure of a holding mechanism facing a package-belt transport path.

[Fig. 7] Fig. 7 is an example of a schematic diagram of a structure of a medication packaging machine including a package-belt line drawing device.

[Fig. 8] Fig. 8 is a plan view of a main portion of the medication packaging machine.

[Fig. 9] Fig. 9 is a plan view of an example of an arrangement where the package-belt line drawing device and a printing mechanism are arranged in parallel.

[Fig. 10] Fig. 10 is a plan view of an example of an arrangement where the package-belt line drawing device and the printing mechanism are arranged opposite each other.

[Fig. 11] Fig. 11 illustrates a package belt on which a line is to be drawn.

[Fig. 12] Fig. 12 illustrates an example of a package belt on which a solid line has been drawn.

[Fig. 13] Fig. 13 illustrates an example of a package belt on which a broken line has been drawn.

Description of Embodiments

[0037] Specific embodiments of a package-belt line drawing device and a medication packaging machine according to the present invention are described in embodiment 1, below.

[0038] The embodiment 1 illustrated in Figs. 1 to 13 is an embodiment of all the above-described solutions.

[0039] In illustration of those, an electric circuit such as a motor driver and an electronic circuit such as a controller are not illustrated, and components required for or related to the description of the present invention are mainly illustrated.

Embodiment 1

[0040] Specific structures of a package-belt line drawing device and a medication packaging machine according to embodiment 1 of the present invention are described with reference to the drawings.

[0041] In the perspective views among the drawings, to indicate the directions of eye sight, the line drawing side is defined as the front, and the left and right are defined in the front view.

[0042] Figs. 1 and 2 illustrate the external appearance of a package-belt line drawing device

10 from which a cover 13 is removed. Fig. 1 is a perspective view of the package-belt line drawing device 10 viewed downward from the front left, and Fig. 2 is a perspective view of the package-belt line drawing device 10 viewed downward from the rear left.

[0043] Figs. 3 and 4 illustrate the external appearance of the package-belt line drawing device 10 to which the cover 13 is attached. Fig. 3 is a perspective view of the package-belt line drawing device 10 viewed downward from the front left, and Fig. 4 is a perspective view of the package-belt line drawing device 10 viewed downward from the front right.

[0044] As to Figs. 5 and 6, Fig. 5 is a perspective view of a writing-tool holding mechanism 30 viewed downward from the front right, and Fig. 6 illustrates an arrangement of mechanisms 52 to 57 and the package-belt line drawing device 10 facing a transport path 53 of a package belt 70. As to Figs. 7 and 8, Fig. 7 is a schematic diagram of a medication packaging machine 40 including a package-belt line drawing device 10, and Fig. 8 is a plan view of a main portion of a wrapping device 50. Similarly, Fig. 9 is a plan view of the package-belt line drawing device 10 and the transport path 53 arranged in parallel to each other. Fig. 10 is a plan view of the package-belt line drawing device 10 and the transport path 53 arranged opposite each other. Fig. 11 illustrates an external appearance of the package belt 70 on which a line is to be drawn.

[0045] As illustrated in Figs. 1 to 5, the package-belt line drawing device 10 includes a writing-tool holding mechanism 30 and a writing-tool switching mechanism 20, as in the case of the above-described package-belt line drawing device for automatic line drawing concurrently with packaging. The writing-tool holding mechanism 30 serves as a holding mechanism that holds coloring tools 60, which are multiple writing tools. The writing-tool switching mechanism 20 serves as a switching mechanism that moves any of the coloring tools 60 forward to a line drawing position. In the present embodiment, the structures of the writing-tool holding mechanism 20 and the writing-tool switching mechanism 30 are improved in the manner described below.

[0046] As described below, a package-belt retreat prevention member 12 is integrally attached in advance to the package-belt line drawing device 10 (see Figs. 3 and 4).

[0047] The writing-tool holding mechanism 30 (see Figs. 1 to 5) includes a bearing for axially supporting a rotator 33 at its center portion. The writing-tool holding mechanism 30 also includes a shaft support portion 31 and a rotator 33. The shaft support portion 31 is attached onto the writing-tool switching mechanism 20. The rotator 33 is axially rotatably held by the shaft support portion 31 and having its rotational axis and rotation center directed frontward and rearward.

[0048] The writing-tool holding mechanism 30 also includes a transmission gear 32 and four writing-tool holding portions 34. The transmission gear 32 is attached to a front end surface of the rotator 33 and located in front of the shaft support portion 31 to transmit a rotational force to the rotator 33. The four writing-tool holding portions 34 are attached to the rotator 33. In the

writing-tool holding mechanism 30, when the transmission gear 32 rotates upon receipt of a rotational force, the rotator 33 axially rotates together with the electric gear 32, so that the writing-tool holding portions 34 move circularly. Moving circularly here refers to a rotational movement of multiple writing-tool holding portions 34 around the rotational center in a predetermined sequence to an engagement position 11, described below.

[0049] As illustrated in Fig. 5, each of the writing-tool holding portions 34 is a thin substantially tube-shaped member extending frontward and rearward and holds a coloring tool 60 inserted from a release front end surface while allowing the coloring tool 60 to be inserted and removed. The writing-tool holding portions 34 are held while being individually inserted into through holes of the rotator 33 and movable frontward and rearward, and urged rearward beyond the rotator 33 by an elastic body such as a spring. Each of the writing-tool holding portions 34 includes a contact target portion 35 directed toward an outer circumference.

[0050] As illustrated in Fig. 1, the writing-tool switching mechanism 20 includes a frame portion including a bottom plate 21, frame plates 22, which stand erect on both sides of the bottom plate 21, and a top plate attached onto the frame plates 22. The writing-tool switching mechanism 20 also includes a rotational driving mechanism 23 to 25 and a straight advance driving mechanism 26 to 28, which are installed inside or on the outer side of the frame portion.

[0051] As illustrated in Fig. 1, the rotational driving mechanism 23 to 25 includes a motor 23, which rotates in accordance with a control of a controlling device, not illustrated, and a driving gear 24, which outputs a rotational movement of the motor 23. The rotational driving mechanism 23 to 25 also includes a gear 25 for transmitting a rotational force of the driving gear 24 to the transmission gear 32. In this structure, the rotational driving mechanism 23 to 25 transmits the rotational force of the motor 23 to the transmission gear 32 to rotationally move the rotator 33 of the writing-tool holding mechanism 30 attached to the writing-tool switching mechanism 20.

[0052] As illustrated in Fig. 2, the straight advance driving mechanism 26 to 28 includes a motor 26, which rotates in accordance with a control of the above-described controlling device in the same manner as the motor 23, and a rotational member 26a, which is driven to rotate to output a rotational movement of the motor 26.

[0053] The straight advance driving mechanism 26 to 28 also includes a circular movement portion 27, which stands erect on the end surface of the rotational member 26a at a portion spaced apart from the rotational center and circularly moves with the rotation of the rotational member 26a. The straight advance driving mechanism 26 to 28 also includes an extruding member 28, disposed to be capable of reciprocatively moving toward and away from the engagement position 11 and, when moved forward, coming into contact with the rear surface of a contact target portion 35 of the writing-tool holding portion 34 at the engagement position 11.

[0054] At the engagement position 11, the writing-tool holding portion 34 positioned at the lowermost position after the circular movement is engaged with the extruding member 28. The writing-tool holding portion 34 located at the lowermost position is moved forward as a result of the extruding member 28 pressing the rear surface of the contact target portion 35.

[0055] A tip portion 61 of each coloring tool 60 held by the corresponding writing-tool holding portion 34 is brought into contact with the package belt 70 by this pressing, so that a line is drawn on the package belt 70 with the coloring tool 60. As described above, the line drawing position for the coloring tool 60 and the engagement position 11 for the writing-tool holding portion 34 are in one to one correspondence with each other.

[0056] The circular movement portion 27 and the extruding member 28 are hinge-jointed to each other to transform a rotational movement of the circular movement portion 27 into a reciprocative movement of the extruding member 28. Hinged joint here refers to a state where at least part of the circular movement portion 27 is inserted into a groove formed in the extruding member 28 to smoothly transform a rotational movement of the circular movement portion 27 into a reciprocative movement of the extruding member 28.

[0057] The straight advance driving mechanism 26 to 28 moves one of the multiple writing-tool holding portions 34 held by the rotator 33 of the writing-tool holding mechanism 30, the one of the multiple writing-tool holding portions 34 being positioned at the engagement position 11 after the circular movement. The above-described controlling device individually controls the motor 23 and the motor 26. Thus, the rotational member 26a can be rotated separately from the above-described rotator 33. Specifically, the circular movement of the writing-tool holding portions 34 with the rotational driving mechanism 23 to 25 can be performed independently from the forward-rearward movement of the writing-tool holding portions 34 at the engagement position 11 with the straight advance driving mechanism 26 to 28.

[0058] As illustrated in Figs. 4 and 5, the writing-tool holding mechanism 30 includes an upper removable portion 36 at a lower end portion of the shaft support portion 31 of the writing-tool holding mechanism 30.

[0059] The writing-tool switching mechanism 20 includes a lower removable portion 29 corresponding to the upper removable portion 36 and opposite the upper removable portion 36 on an upper surface portion of the writing-tool switching mechanism 20.

[0060] The upper removable portion 36 and the lower removable portion 29 are engaged with or disengaged from each other when laterally moved relative to each other. Thus, the writing-tool switching mechanism 20 supports the writing-tool holding mechanism 30 while allowing the writing-tool holding mechanism 30 to be attached thereto or removed therefrom. Specifically, when the writing-tool holding mechanism 30 is caused to slide sideways over the writing-tool switching mechanism 20 to be engaged, the writing-tool holding mechanism 30 is attached onto the writing-tool switching mechanism 20, and the attached writing-tool holding mechanism 30 has its bottom supported by the writing-tool switching mechanism 20.

[0061] When the writing-tool holding mechanism 30 is caused to slide sideways to be disengaged, the writing-tool holding mechanism 30 is removed from the writing-tool switching mechanism 20.

[0062] As illustrated in Figs. 1 to 4, when the writing-tool switching mechanism 20 and the writing-tool holding mechanism 30 are attached to or removed from each other, the gear 25 and the transmission gear 32 are engaged with or disengaged from each other. Specifically, the rotator 33 and the rotational driving mechanism 23 to 25 are engaged or disengaged in accordance with the attachment or removal of the writing-tool holding mechanism 30 to or from the writing-tool switching mechanism 20.

[0063] As illustrated in Figs. 3 and 4, the package-belt retreat prevention member 12 is, for example, a letter L-shaped plate member having a short lower end portion and a long erect portion. The package-belt retreat prevention member 12 has its lower end portion fastened to the front end portion of the frame plate 22 of the writing-tool switching mechanism 20 by, for example, being screwed, and has an upper end portion of its erect portion located in front of the writing-tool holding portion 34 at the engagement position 11 and the corresponding coloring tool 60. As illustrated in Fig. 6, when the package-belt line drawing device 10 is installed to face the transport path 53 for the package belt 70, preferably, the package belt 70 is installed between the package-belt retreat prevention member 12 and the writing-tool holding portion 34 at the engagement position 11 and the corresponding coloring tool 60 at the line-drawing position. This arrangement allows the package-belt retreat prevention member 12 to be attached to the writing-tool switching mechanism 20 below the transport path 53 for the package belt 70.

[0064] In this arrangement, when the writing-tool holding portion 34 at the engagement position 11 is moved forward by the writing-tool switching mechanism 20, the tip portion 61 of the coloring tool 60 at the engagement position 11 moves forward to a line drawing position 11', with the forward movement. The tip portion 61 of the coloring tool 60 thus comes into contact with the package belt 70 and presses the contact portion. Here, the package-belt retreat prevention member 12 is disposed opposite the tip portion 61 with the package belt 70 interposed therebetween.

[0065] Thus, the package-belt retreat prevention member 12 prevents the package belt 70 from being retracted a distance longer than required by being pressed by the tip portion 61.

[0066] As illustrated in Figs. 6 to 9, a medication packaging machine 40 includes the package-belt line drawing device 10 disposed to face the transport path 53 for the package belt 70.

[0067] Here, a structure disposed to face the transport path 53 refers to a structure disposed along the transport path 53 for the package belt 70.

[0068] The package-belt line drawing device 10 is disposed in the state where the package

belt 70 and the transport path 53 for the package belt 70 are interposed between a set of the writing-tool switching mechanism 20 and the writing-tool holding mechanism 30, which serve as a main body, and the package-belt retreat prevention member 12, which is an additional portion of the package-belt line drawing device 10.

[0069] As illustrated in Fig. 7, a wrapping device 50 includes a tablet feeding portion 41, a powder feeding portion 42, a wrapping device 50, and a controlling device, not illustrated. The tablet feeding portion 41 falls tablets to be packaged. The powder feeding portion 42 falls powdered medications to be packaged. The wrapping device 50 receives a fallen medication and separately encloses the medication in the package belt 70.

[0070] As illustrated in Figs. 6 and 8, the wrapping device 50 includes a feeding portion 52 on the upper surface of a substrate 51. The feeding portion 52 unrolls the package belt 70 to feed the package belt 70 forward. The package-belt line drawing device 10, a printing mechanism 54, a dosing mechanism 55, a sealing mechanism 56, and a traction mechanism 57 are also disposed on the upper surface of the substrate 51 to face the transport path 53 when the package belt 70 is fed forward in the longitudinal direction. To dispose the package-belt line drawing device 10, in the state, as described above, where the transport path 53 is interposed between the package-belt line drawing device 10 and the package-belt retreat prevention member 12 and in the state where the tip portion 61 of the coloring tool 60 held by the writing-tool holding portion 34 at the engagement position 11 is in a line drawing position 11', the package-belt line drawing device 10 is attached to the substrate 51.

[0071] In a case where a required space can be secured next to the printing mechanism 54, the writing-tool switching mechanism 20 and the writing-tool holding mechanism 30 may be disposed in the space.

[0072] As illustrated in Fig. 9, when the space next to the printing mechanism 54 is narrow, only the package-belt retreat prevention member 12 is disposed next to the printing mechanism 54, and the writing-tool switching mechanism 20 and the writing-tool holding mechanism 30 of the package-belt line drawing device 10 are disposed opposite the printing mechanism 54 in obliquely front of the printing mechanism 54.

[0073] The usage and the operation of the package-belt line drawing device 10 and the medication packaging machine 40 according to embodiment 1 are described with reference to the drawings. Fig. 11 illustrates the package belt 70, on which a line is to be drawn and in the state of not receiving a line, and Fig. 12 illustrates the package belt 70 that has received a solid line 81 as a colored line 80. Fig. 13 illustrates the package belt 70 that has received a broken line 82 as the colored line 80. In the illustration of the package belt 70, specific print examples on wrapper portions 72 and the illustration of a medication in each wrapper portion 72 are omitted.

[0074] Prior to the use of the medication packaging machine 40, coloring tools 60 are attached to the package-belt line drawing device 10. The coloring tools 60 may be, for example,

commercially available color pens that dry slowly. As illustrated in Fig. 5, the coloring tools 60 are used while having the tip portions 61 protruding from the center of one end surface of the cylindrical body. Specifically, when the consumption of four times a day, for example, morning, noon, evening, and night is assumed, four coloring tools 60 having the colors corresponding in one to one to the times of consumption are prepared. Then, as illustrated in Fig. 7, the substrate 51 is drawn out from the wrapping device 50 of the corresponding medication packaging machine 40 and, in the package-belt line drawing device 10, the writing-tool holding mechanism 30 is removed from the writing-tool switching mechanism 20. After the writing-tool holding mechanism 30 is removed, each coloring tool 60 is inserted into the corresponding writing-tool holding portion 34. Then, as illustrated in Fig. 3, the writing-tool holding mechanism 30 is attached again to the original writing-tool switching mechanism 20 and the substrate 51 is pushed back into the wrapping device 50.

[0075] After the operation of the corresponding medication packaging machine 40 is prepared, the next operation is performed. Specifically, whether tablets or powdered medications that are to be packaged are prepared in the tablet feeding portion 41 or the powder feeding portion 42 and whether the package belt 70 is placed on the transport path 53 of the wrapping device 50 are checked. When the package belt 70 is placed on the transport path 53 of the wrapping device 50, the controlling unit provides the medication packaging machine 40 with medication preparation data containing a command for drawing a line on the package belt 70 through, for example, a command operation or downloading. In an automatic control of the controlling device for the package belt 70 based on the provided medication preparation data, the wrapping device 50 repeatedly inserts medications into the package belt 70 and separately encloses the medications to sequentially form the wrapper portions 72.

[0076] After the wrapping device 50 has formed the wrapper portions 72 on the package belt 70, the package-belt line drawing device 10 draws a line on the package belt 70.

[0077] The operation of drawing lines is described in detail. In the support of drawing lines, for example, a command for drawing lines, that is, whether a line is drawn on the package belt 70, and if yes, whether the line is a broken line or a solid line or in which color is issued by an automatic control of the controlling device for the package belt 70.

[0078] When the command for drawing lines indicates "none", the extruding member 28 remains in the retract position. Thus, the tip portion 61 of each coloring tool 60 neither comes into contact with the package belt 70 nor a line is drawn on a sealed edge 71 of the package belt 70, as illustrated in Fig. 11.

[0079] On the other hand, when the command for drawing lines indicates "solid line", the coloring tool 60 of the color corresponding to the consumption timing is moved to the engagement position by the circular movement of the writing-tool holding portions 34. The coloring tool 60 that has arrived at the engagement position 11 is held while being pressed by the extruding member 28 that has moved forward. The tip portion 61 of the coloring tool 60 is moved to the line drawing position 11' and pressed against the package belt 70 by the

extruding member 28. At this time, the retreat prevention member 12 is disposed opposite the tip portion 61 with the package belt 70 interposed therebetween. Thus, the package belt 70 is less likely to be loosened. In this manner, when the tip portion 61 of the coloring tool 60 located at the engagement position 11 moves forward, a solid line 81 is drawn on uppermost portions of the wrapper portions 72, as illustrated in Fig. 12, in accordance with the transportation of the package belt 70 in the longitudinal direction.

[0080] When the command for drawing lines indicates "broken line", as in the case of the solid line, the coloring tool 60 of the color corresponding to the consumption timing is moved to the line drawing position 11' by the circular movement of the writing-tool holding portions 34. Here, unlike in the case of the solid line, while the package belt 70 is being transported in the longitudinal direction for separately packaging medications, the rotational member 26a rotates in synchronization with the transportation of the package belt 70 in the longitudinal direction.

[0081] In this rotational movement, the extruding member 28 repeatedly moves forward and rearward, and thus the coloring tool 60 at the engagement position 11 repeatedly reciprocatively moves back and forth, so that the tip portion 61 and the package belt 70 intermittently come into contact with each other. With this operation, a broken line 82 is drawn on uppermost portions of the wrapper portions 72 in accordance with the transportation of the package belt 70 in the longitudinal direction.

[0082] In this manner, the package belt 70 automatically formed by the medication packaging machine 40 undergoes normal print at the wrapper portions 72 and also receives a line of the color corresponding to the consumption timing according to the line drawing command.

[0083] The line-drawing position is most preferably, for example, an uppermost portion of each wrapper portion 72 that is aside from the sealed edge 71 affected by heat seal at the sealing mechanism 56 and aside from the print area at the printing mechanism 54 as far as possible.

Industrial Applicability

[0084] A package-belt line drawing device according to the present invention stops drawing lines to change colors and circulates coloring tools. The package-belt line drawing device according to the present invention is thus preferably used for drawing lines on a package belt in the form of a combination of packages for each consumption timing, for example, a combination of only packages for morning consumption or a combination of only packages for noon consumption for multiple days. However, the package-belt line drawing device according to the present invention is not limited to this structure. When automatic processing is preferred to the efficiency, the package-belt line drawing device is applicable to and usable for a package belt including a combination of packages for different consumption timings.

[0085] A medication packaging machine according to the present invention is not only installable in, as in the above-described example, a medication packaging machine including

both a tablet feeding portion and a powder feeding portion, and is also applicable to a tablet packaging machine that manages only tablets or a powder packaging machine that manages only powdered medications.

[0086] The medication packaging machine is also applicable to drawing lines in four or more colors. Reference Signs List

[0087]

10
: package-belt line drawing device

11
: engagement position

11'
: line drawing position

12
: package-belt retreat prevention member

13
: cover

20
: writing-tool switching mechanism

21
: bottom plate

22
: frame plate

23 to 25
: rotational driving mechanism

23
: motor

24
: driving gear

25
: transmission gear

26 to 28
: straight advance driving mechanism

26
: motor

26a
: rotational member

27
: circular movement portion

28
: extruding member

29

lower removable portion

30 writing-tool holding mechanism

31 shaft support portion

32 transmission gear (rotation receiver)

33 rotator

34 writing-tool holding portion

35 contact target portion

36 upper removable portion

40 medication packaging machine

41 tablet feeding portion

42 powder feeding portion

50 wrapping device

51 substrate

52 feeding portion

53 transport path

54 printing mechanism

55 dosing mechanism

56 sealing mechanism

57 traction mechanism

60 coloring tool

61 tip portion

70 package belt

71

sealed edge

72

wrapper portion

80

colored line

81

solid line

82

broken line

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP2006321516A **[0011]**
- WO2014076704A1 **[0011]**

Patentkrav

1. Linjetegningsindretning til emballagebånd (10), omfattende:
en fastholdelsesmekanisme (30), der indeholder en flerhed af skriveredskaber; og
kendetegnet ved, at linjetegningsindretningen til emballagebånd yderligere omfatter en omskiftermekanisme (23-25), der bevæger et hvilket som helst af skriveredskaberne fremad til en linjetegningsposition,
hvor fastholdelsesmekanismen holder en rotator (33), mens den tillader rotatoren at bevæge sig roterende, og holder skriveredskaberne, mens den tillader skriveredskaberne at bevæge sig fremad og bagud, hvor rotatoren omfatter et flerhed af fastholdelsesdele, der hver især bærer skriveredskaberne,
hvor rotatoren bevæger fastholdelsesdelene cirkulært med rotationsbevægelsen, mens den presser fastholdelsesdelene bagud, og
hvor omskiftermekanismen omfatter en rotationsdrivmekanisme og en fremadgående drivmekanisme, hvor den roterende drivmekanisme er i indgreb med fastholdelsesmekanismen for at bevæge rotatoren i rotation, hvor den fremadgående drivmekanisme bevæger en hvilken som helst af fastholdelsesdelene, der er placeret ved en indgrebsposition af rotationsbevægelsen, frem til linjetegningspositionen.

2. Linjetegningsindretning til emballagebånd ifølge krav 1,
hvor enhver af fastholdelsesdelene holder et tilsvarende af skriveredskaberne, mens det er muligt at indsætte skriveredskabet deri eller fjerne det derfra, og
hvor omskiftermekanismen bærer fastholdelsesmekanismen, mens den gør det muligt for fastholdelsesmekanismen at blive fastgjort dertil eller løsnet derfra.

3. Linjetegningsindretning til emballagebånd ifølge krav 2,

hvor fastholdelsesmekanismen er fastgjort til en øvre del af omskiftermekanismen, og
hvor rotatoren og den roterende drivmekanisme bringes i indgreb eller løsgøres med en fastgørelse eller fjernelse af fastholdelsesmekanismen til eller fra omskiftermekanismen.

4. Linjetegningsindretning til emballagebånd ifølge et hvilket som helst af kravene 1 til 3,
hvor den fremadgående drivmekanisme omfatter
et ekstruderingselement, der kan bevæges frem- og tilbagegående frem til og tilbage fra indgrebspositionen, hvor ekstruderingselementet bevæger fastholdelsesdelen, der er placeret ved indgrebspositionen fremad ved at komme i kontakt med fastholdelsesdelen, når den fremadgående drivmekanisme bevæger sig fremad,
et rotationselement, der er anbragt separat fra rotatoren, og som roterer uafhængigt af rotatoren, og
en cirkulær bevægelsesdel, der er anbragt på rotationselementet, og som bevæger sig cirkulært med en rotation af rotationselementet, og
hvor den cirkulære bevægelsesdel og ekstruderingselementet er hængslet sammen for at transformere den cirkulære bevægelse af den cirkulære bevægelsesdel til en frem- og tilbagegående bevægelse af ekstruderingselementet.

5. Linjetegningsindretning til emballagebånd ifølge et hvilket som helst af kravene 1 til 4, yderligere omfattende et tilbagetrækningsforebyggelseselement, der er koblet til en nedre del af omskiftermekanismen og anbragt til at vende mod det skriveredskab, der er placeret ved linjetegningspositionen.

6. Medicinemballagemaskine omfattende:
en linjetegningsindretning til emballagebånd ifølge et hvilket som helst af kravene 1 til 4; og

et tilbagetrækningsforebyggelseselement, der er anbragt over for linjeteg-ningsindretningen til emballagebånd med en emballagebåndtransportbane, der er anbragt derimellem,

hvor tilbagetrækningsforebyggelseselementet holder emballagebåndet, når skriveredskabet trækker en linje på emballagebåndet for at begrænse embal-lagebåndet fra at bevæge sig mod tilbagetrækningsforebyggelseselementet.

DRAWINGS

Fig.1

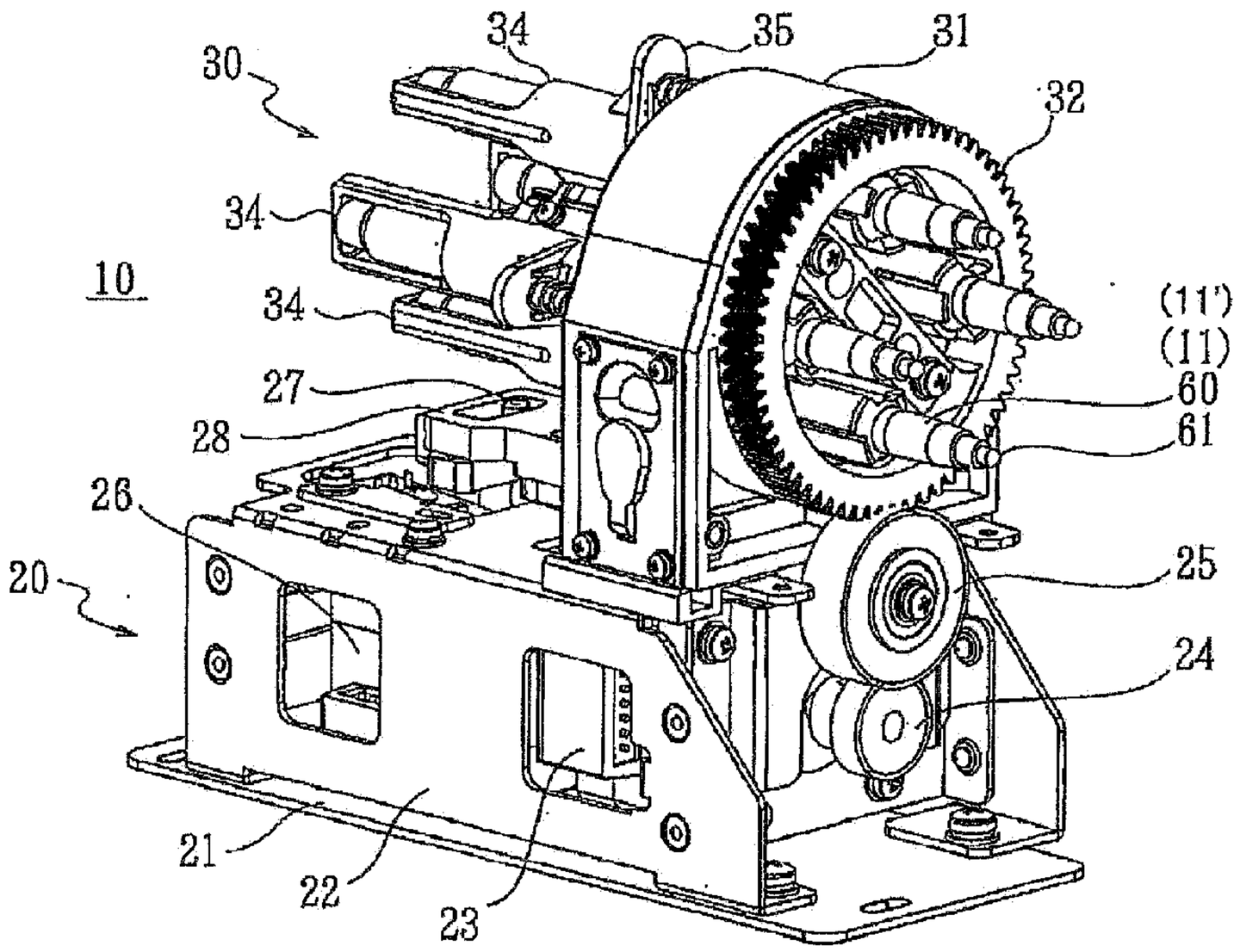


Fig.2

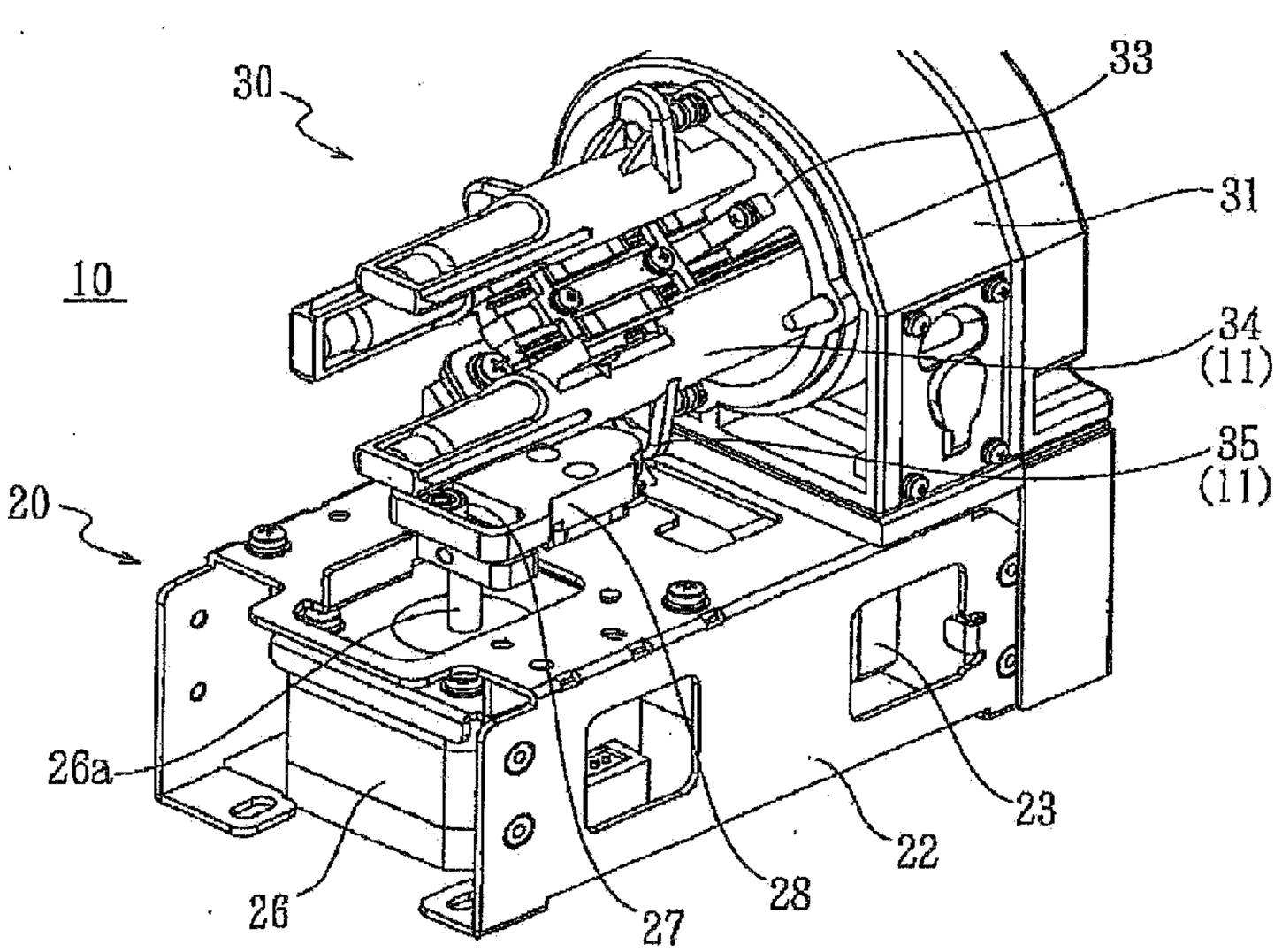


Fig.3

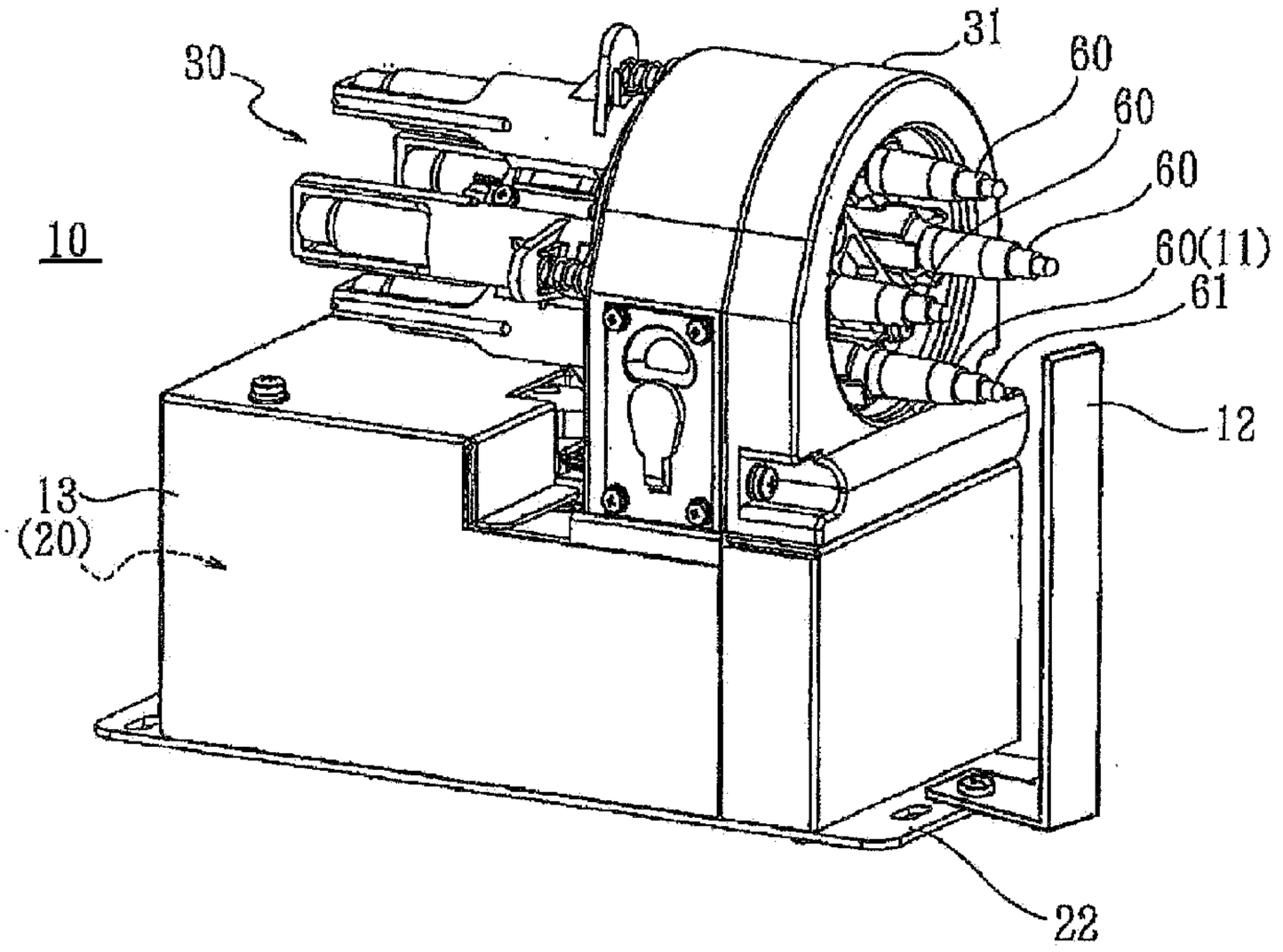


Fig.4

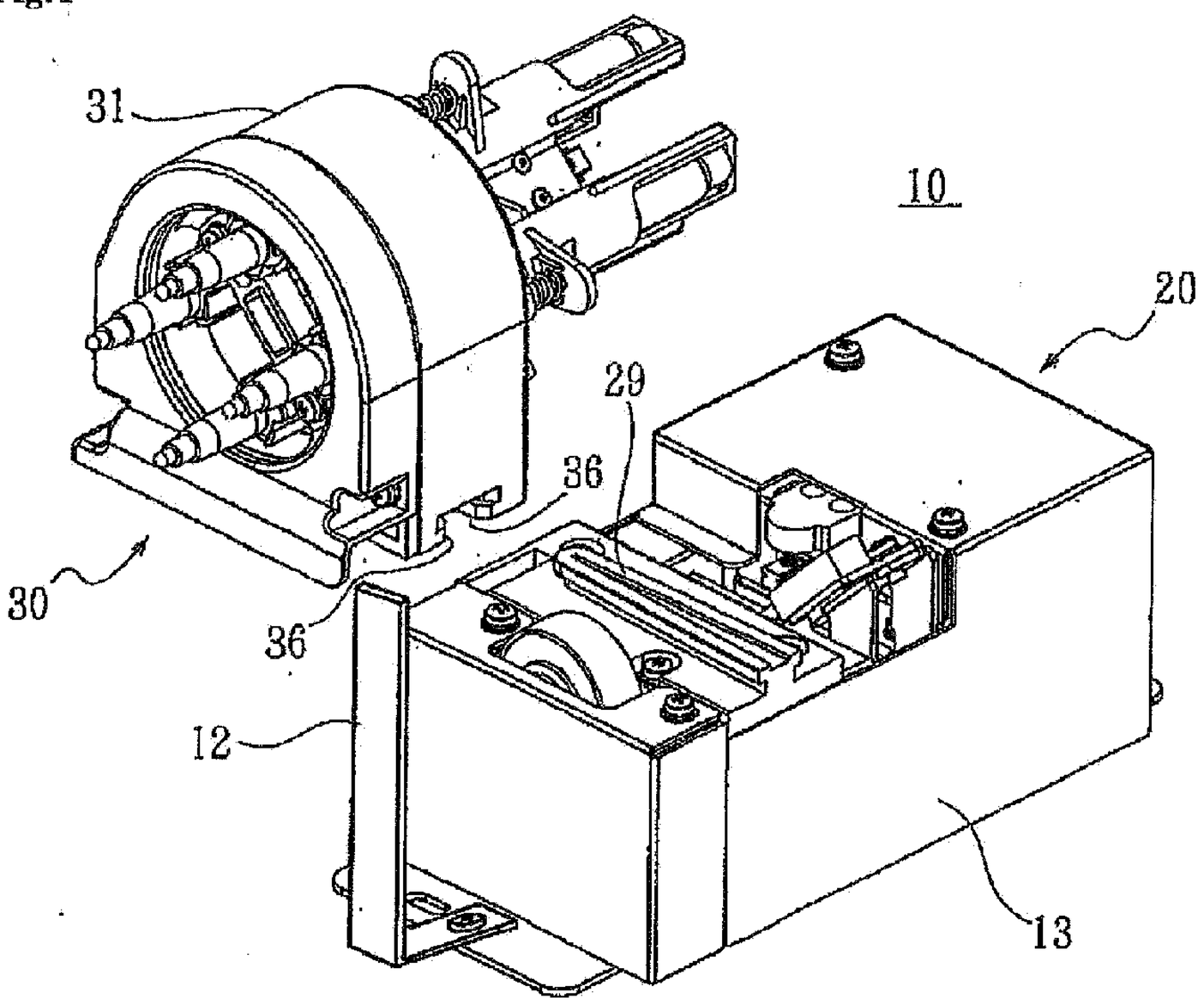


Fig.5

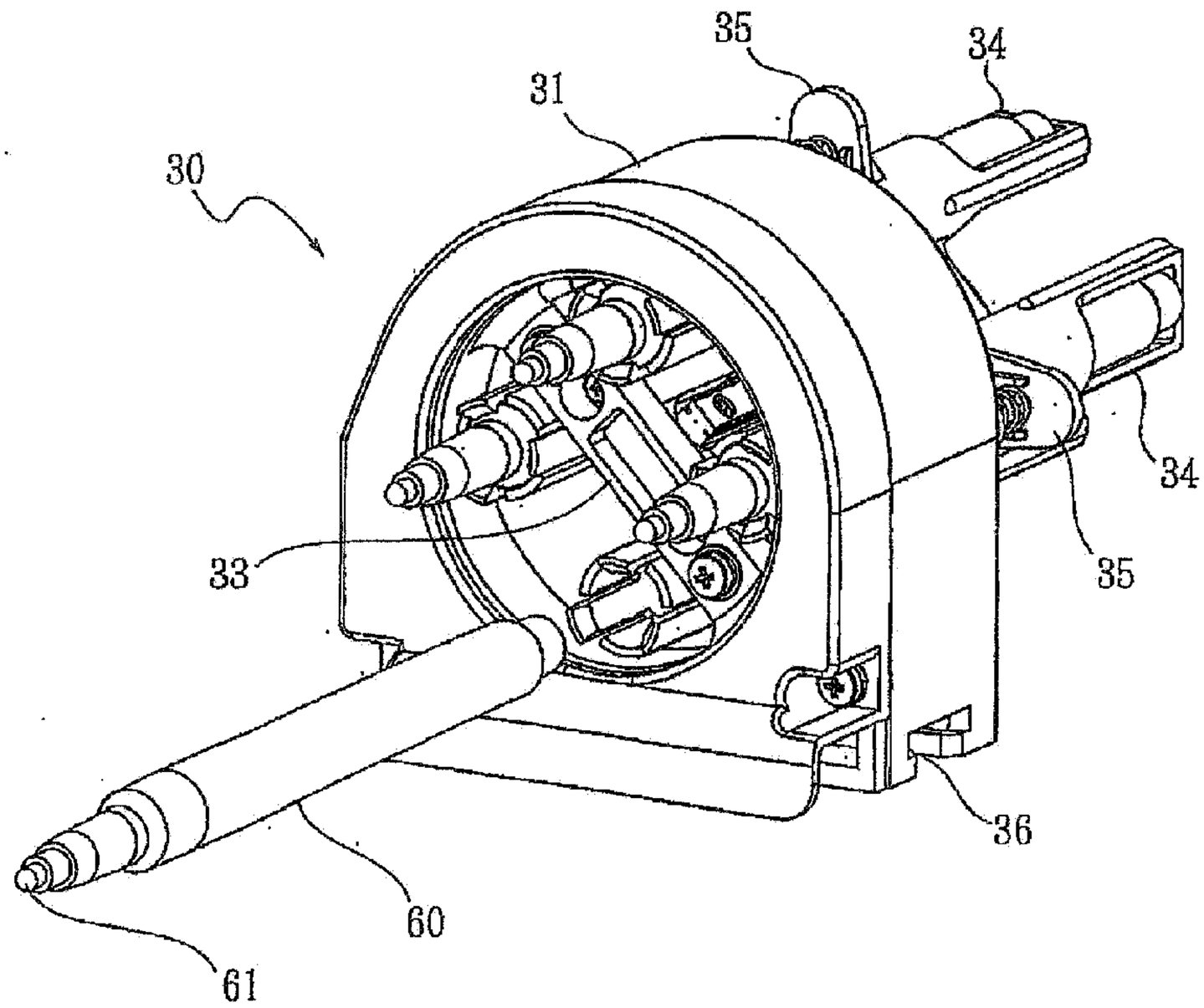


Fig.6

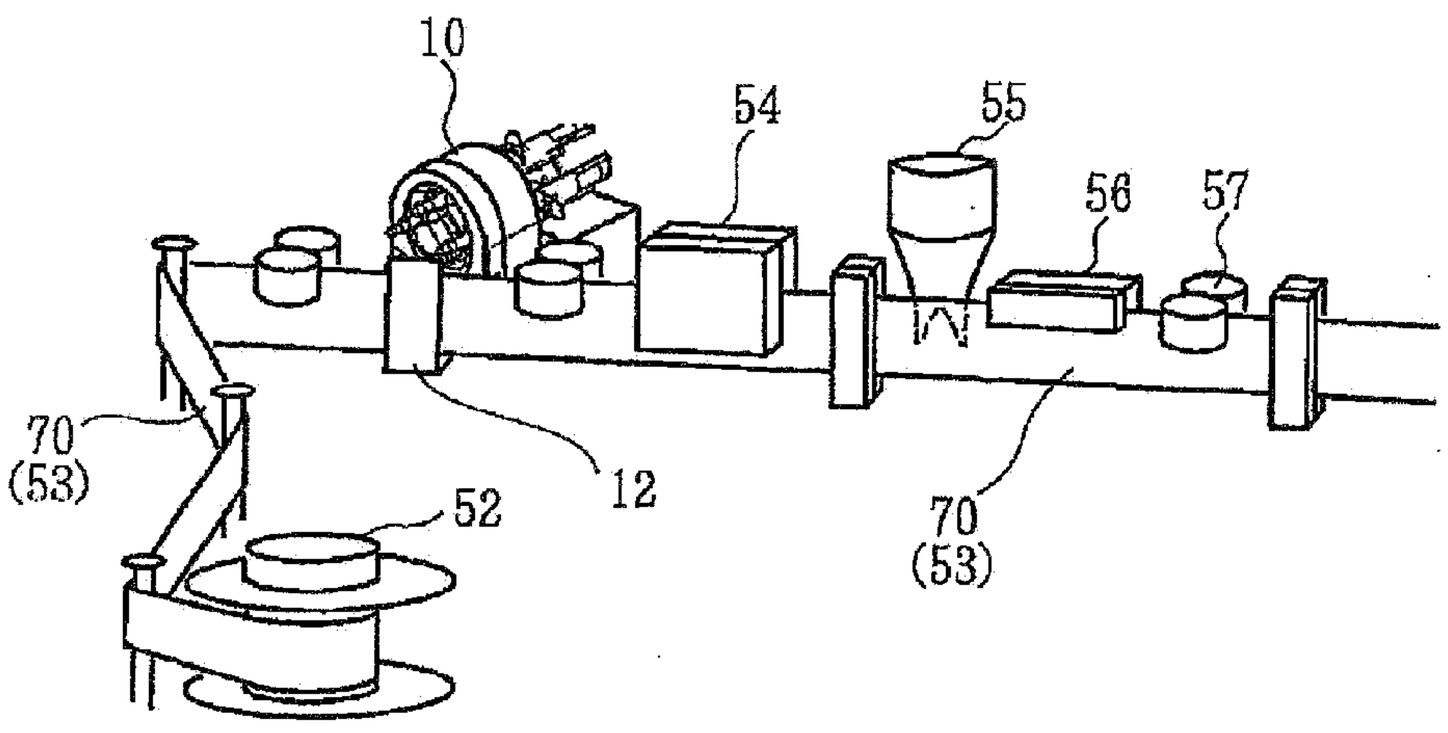


Fig.7

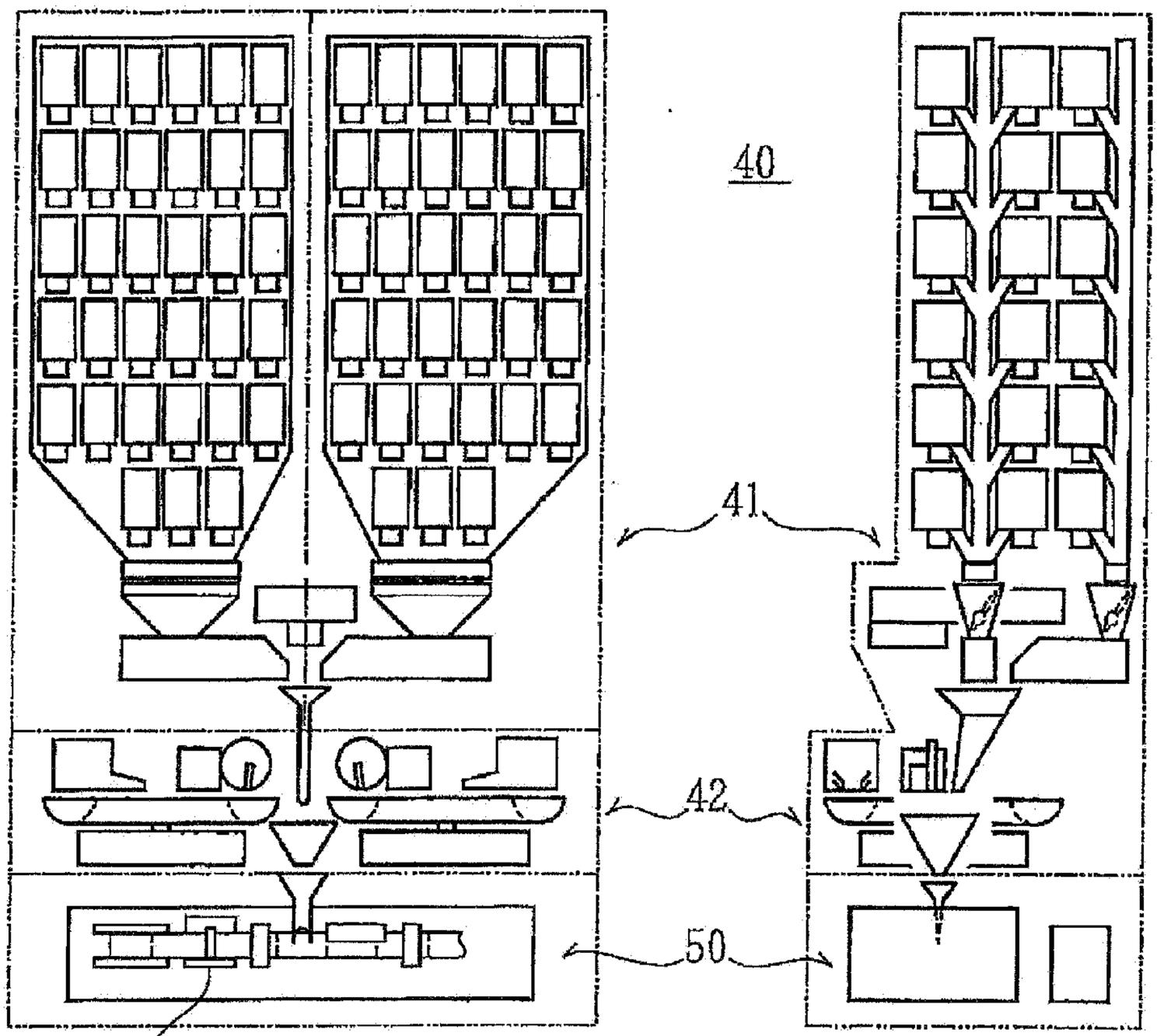


Fig.8

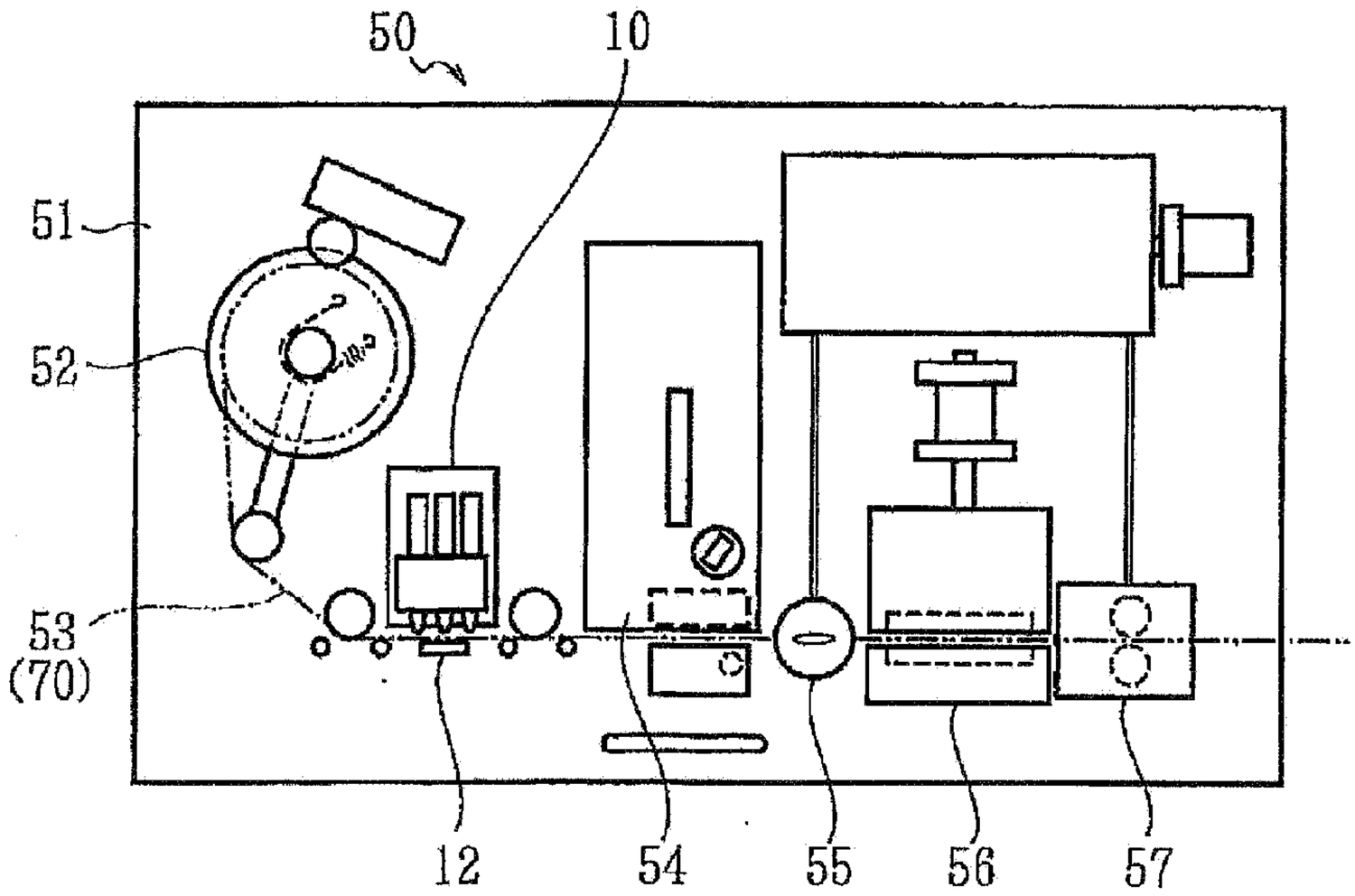

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Fig.9

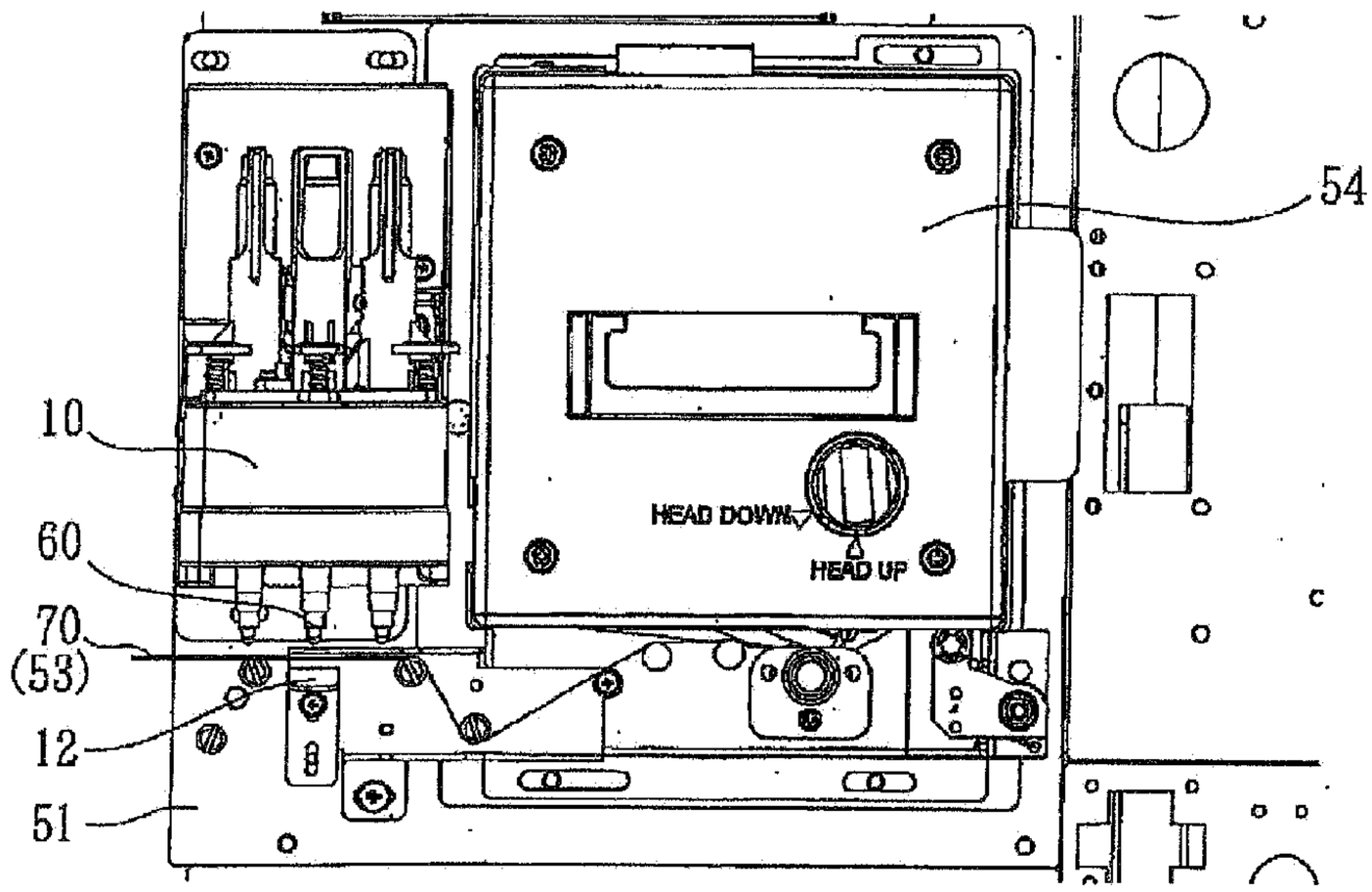

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10
60
70
(53)
12
51
HEAD DOWN
HEAD UP

Fig.10

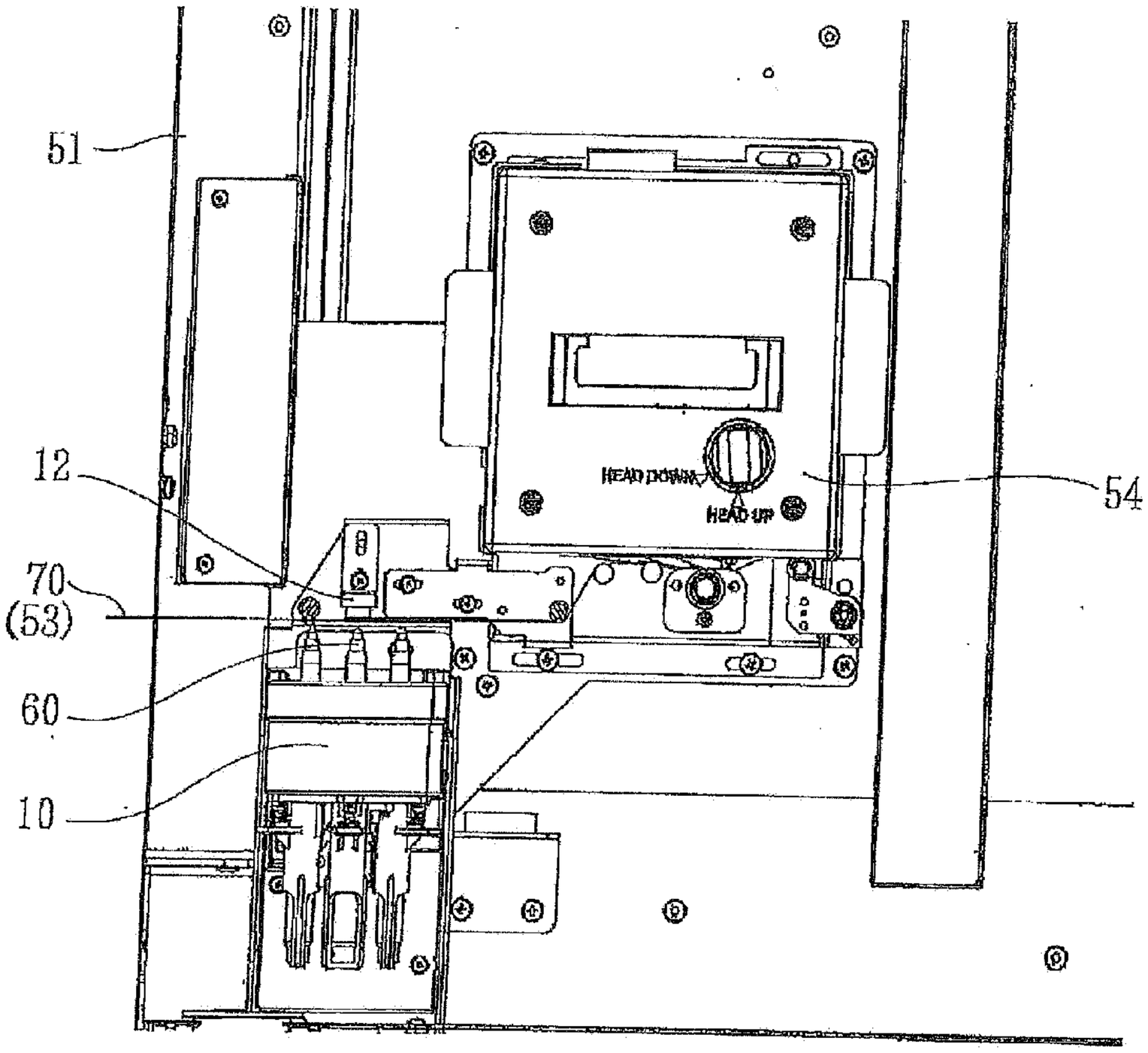

51
12
70
(53)
60
10
HEAD DOWN
HEAD UP
54

Fig.11

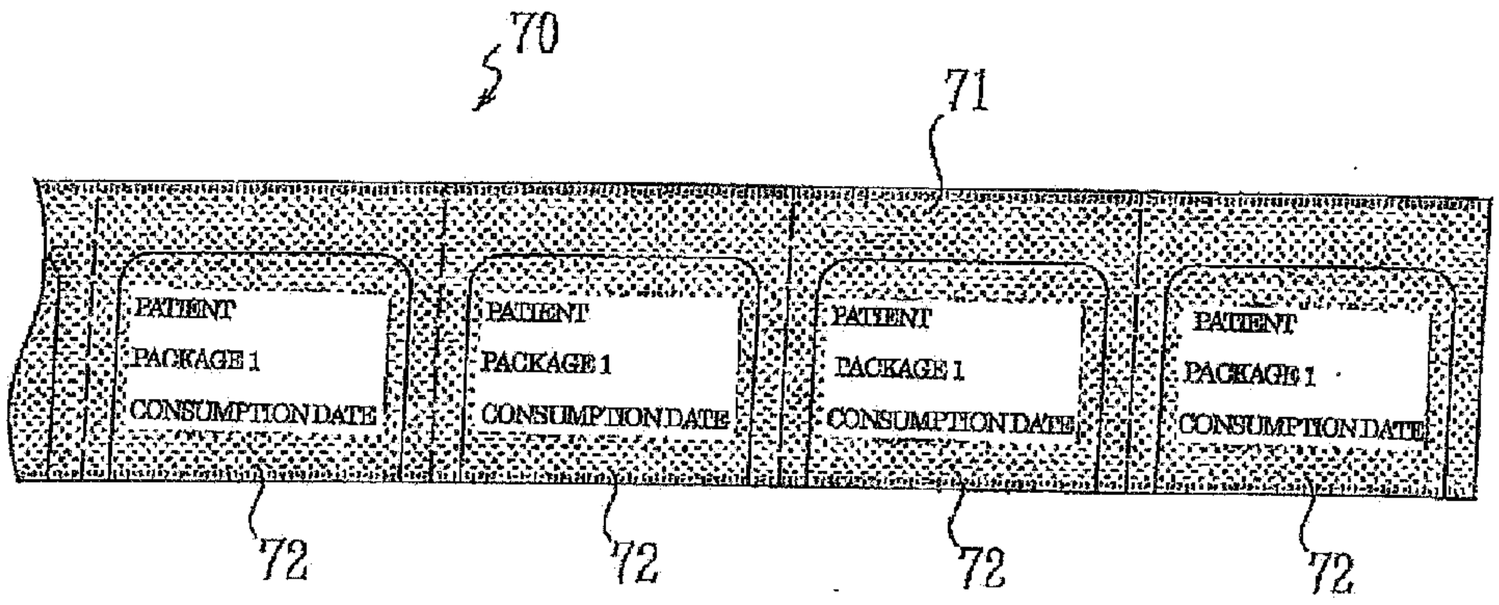

70
71
PATIENT
PACKAGE 1
CONSUMPTION DATE
72

Fig.12

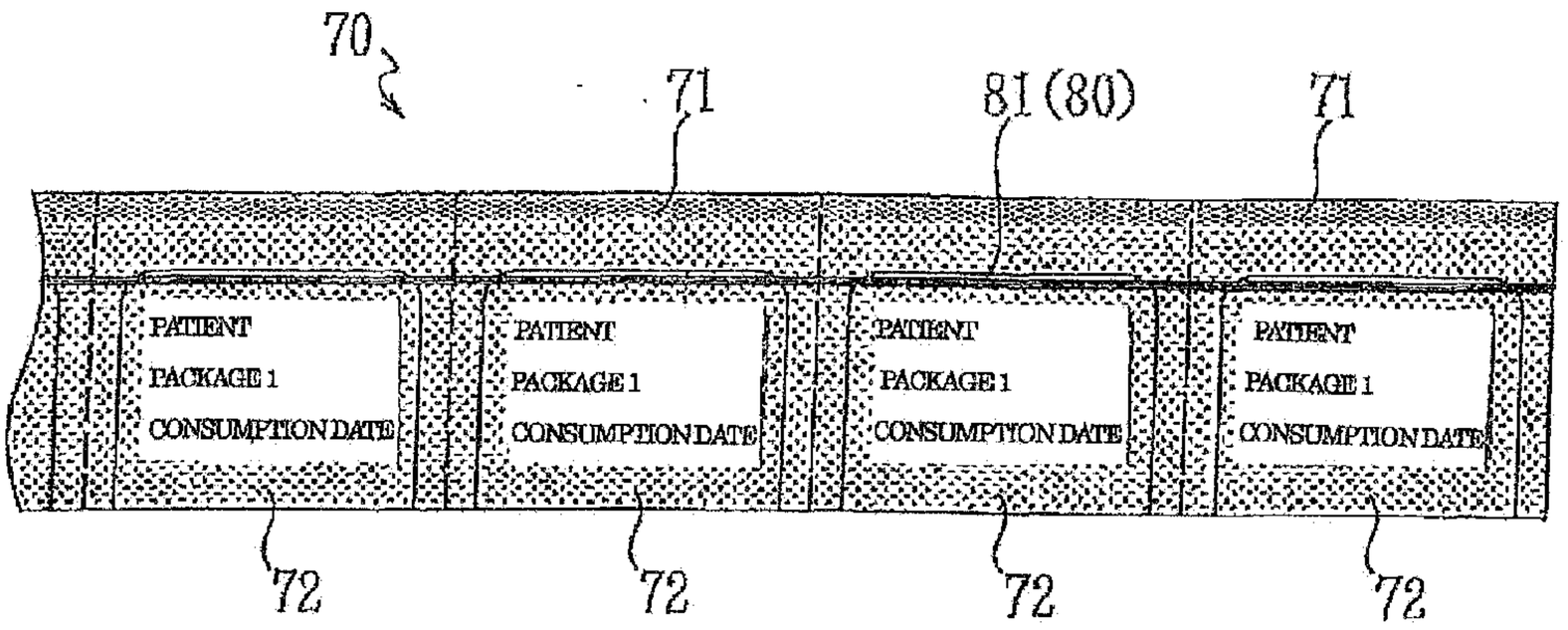
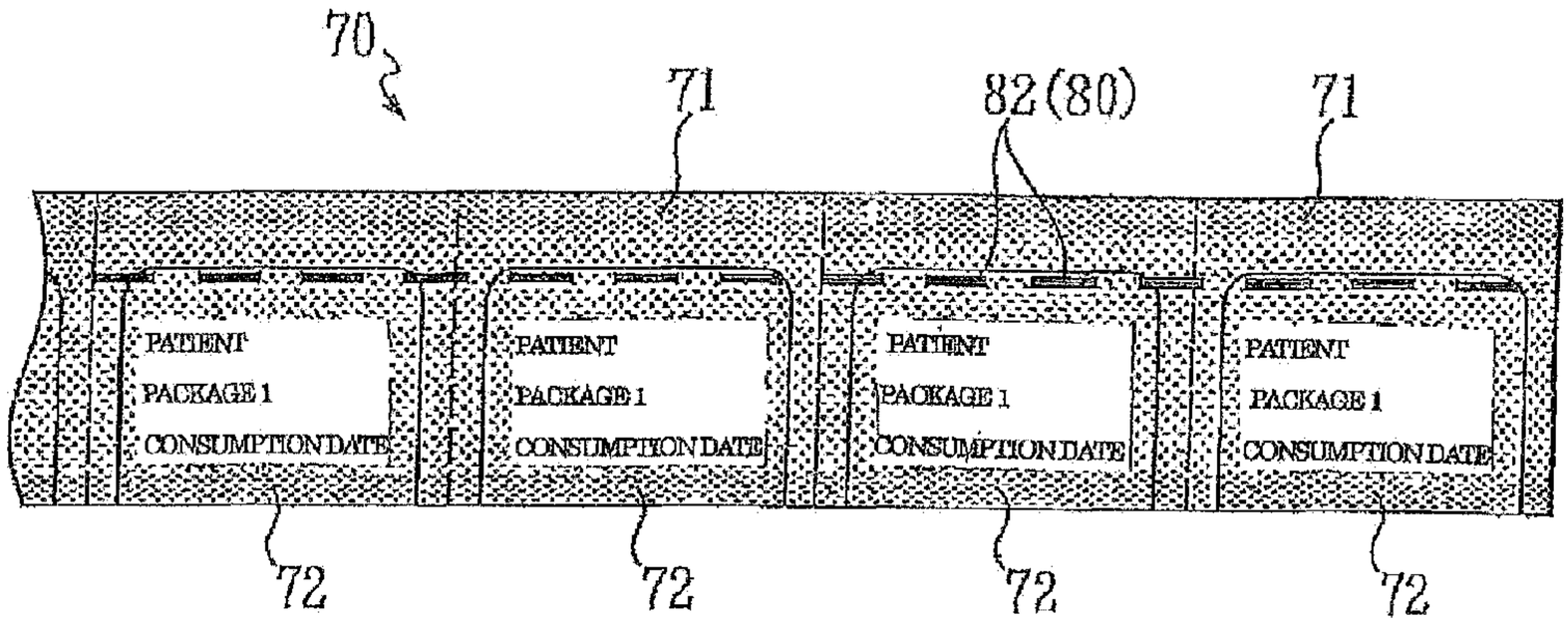

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PACKAGE 1
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72
72
72

Fig.13


70
71
82 (80)
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