



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 004 512 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
08.01.2003 Bulletin 2003/02

(51) Int Cl.7: **B65B 63/06**

(21) Application number: **99122744.8**

(22) Date of filing: **16.11.1999**

(54) **A process for winding up and binding, by means of a tape of plastic film, lengths of filiform elements, such as cables, ropes and the like, in particular mains cords, wound in the form of skeins, and a machine to implement such process**

Verfahren und Vorrichtung zum Aufrollen und Binden, mittels eines Kunststoffbindestreifens, von aufgerollten Strängen von Längen drahtförmiger Elemente, wie Kabel, Seile und dergleichen, insbesondere Netzkabel

Procédé et machine pour enrouler et lier, à l'aide d'une bandelette plastique, des longueurs d'éléments filiformes, tels que des câbles, cordes et similaires, spécialement des câbles principaux, enroulés en écheveau

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

(30) Priority: **23.11.1998 IT MI982526**

(43) Date of publication of application:
31.05.2000 Bulletin 2000/22

(73) Proprietor: **New.Mec. di Segreto Francesco & C.
S.a.s.
21052 Busto Arsizio (VA) (IT)**

(72) Inventors:
• **Bianco, Alessandro
21010 Ferno (VA) (IT)**
• **Segreto, Francesco
21052 Busto Arsizio (VA) (IT)**

(74) Representative: **Klausner, Erich et al
c/o Ufficio Internazionale Brevetti
Ing. C. Gregorj S.p.A.
Via Dogana 1
20123 Milano (IT)**

(56) References cited:
EP-A- 0 160 347 US-A- 4 406 109

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 004 512 B1

Description

[0001] The present invention relates to a process for winding up and binding, by means of a tape of plastic film, lengths of filiform elements, such as cables, ropes and the like, in particular mains cords, wound in the form of skeins, and a winding and binding machine for implementing such process.

[0002] Merely by way of example the instant invention will be disclosed with reference to a typical application thereof, designed for meeting certain technical requirements, as will be seen hereinafter, without limiting the invention to said disclosed application.

[0003] As it is known, several industries, such as the household electric appliance industry, demand the supply of different types of electric cables or mains cords, even in very large quantities, i.e. up to tens of thousands, said electric cables or mains cords having to be supplied together with the finished appliance at the time of sale of the latter.

[0004] In order to reduce their volume and for the convenience of use, said electric cables are demanded in the form of skeins tied together by means of a binding element, one end of which electric cable, already provided with a user mains coupling plug, projecting from the skein, while the other end of said electric cable, it too projecting from the skein, has the two phase wires and the earth wire ready for connection to the appliance.

[0005] In this manner, the coupling cable can be connected to the electric appliance prior to its packaging, and the installer or user must merely free the skein of its binding element for switching on the appliance.

[0006] The winding-up and binding operations of the electric cables or cords, which have a length prescribed by the appliance manufacturer, are generally performed by outside suppliers using hardly automatized apparatus, which presents the following drawbacks:

- it does not allow to automatically load the electric cables at the starting step;
- it employs a winding mandrel capable of a very limited extension variation;
- loss of time due to the manual loading of the cable lengths onto the mandrel;
- the manual measurement of the projecting end of the cable provided with a plug with respect to the skein itself;
- its production yield is comparatively low, i.e. almost near to that of a manual process, with consequently high costs due to extensive use of labour;
- the skein is bound by a plasticized binding element having a metal core, which is far from welcome because an exposed portion thereof can cause damage to the cable surface or can injure the user.

[0007] The object of the present invention is to overcome the above mentioned drawbacks, by contemplating the use of a machine designed for automatically per-

forming the required operating steps, with a high production yield, thereby allowing few machines to meet a large production volume, saving on labour and performing the binding of the lengths skein using only a tape of thermo-weldable, metal-core-free plastic material which does not cause the cited drawbacks.

[0008] The main design concepts of the automatic binding machine according to the instant invention are recited in claims 1 and 2. Substantially they are as follows:

- manually depositing of the single lengths onto a movable rack;
- automatically grasping of the lengths by a clamp and transferal controlled by photoelectric cells of said lengths from the loading zone to the processing zone;
- automatically setting of the measurement of the extremity of the lengths provided with a plug, projecting from the skein depending on the stroke of the grasping clamp;
- providing a winding-up mandrel group with a broad changing range of the skein coil length, including a winding-up core and clamps for holding the lengths provided during rotation as well as a driving element for deviating the extremity of lengths projecting into a cylindrical basket;
- grasping a still loose skein at its middle portion for transferring it by means of a movable clamp, to a second working station, which is independent from the first but operating in series therewith, with evident saving on time, in said second working station the skein is taken up by a pair of end clamps, is released by a middle clamp and lowered against a tape of plastic material envelopping it substantially around its circumferential perimeter;
- welding the tape of thermo-weldable and optionally thermo-shrinkable plastic material by means of a pair of heated heads, after having compacted the skein;
- cutting of the tape between the two weldings, so as to maintain the continuity of said tape, allowing a length thereof to advance so as to present a fresh tape portion for winding round about a subsequent skein;
- laterally ejecting the envelopped lengths and collecting it in a container;
- a high production yield thanks to the automation of the various operating steps.

[0009] The machine according to the invention for implementing what disclosed above, by way of example, in connection with the winding-up and binding of an electric cable provided with a plug at an end portion thereof projecting from the skein, will be better understood from the following description with reference to the accompanying drawings, wherein:

Figure 1 is an overall top plan view of the machine; Figure 2 is a front elevation view showing the machine of Figure 1;

Figure 3 is a top plan view, on an enlarged scale, showing the working surface of the winding-up and binding machine according to the invention;

Figures 4A e 4B are front elevation views, partially cross-sectioned, showing a detail of the winding-up mandrel assembly, in two subsequent operating steps thereof;

Figure 5 shows the clamp group for grasping the horizontally arranged wound skein, and the transfer of the skein to the second working station above the binding tape to be thermo-welded;

Figure 6 shows the opening of the transferring clamp from the first to the second working station and the engagement of the skein, at its two ends, by means of two clamps which cause the skein to be lowered against the binding tape;

Figure 7 shows the thermo-welding of the binding tape and the cutting of the thermo-welded tape; and

Figure 8 is a side elevation view showing a length as wound and bound according to the invention.

[0010] Figures 1 and 2 schematically show, in a top plan view and a front elevation view, respectively, the winding-up and binding machine according to the instant invention.

[0011] This machine, generally indicated by reference numeral 1, has, as seen in a top plan view, an angled, very compact shape, and it is provided with two working stations 4 and 6 which perform, in series, two different, mutually complementary operations so that, while the second station 6 completes the process of the first, the first station 4 is ready to start a subsequent winding-up operation, with an evident advantage with regard to the rapidity of performing the entire process.

[0012] In Figures 1 and 2, an operator A, who avails himself of a control keyboard T to start or stop the machine or one of its parts, will simply feed, on a conveyor belt 2, consisting of articulated elements, the lengths 3 with their end 31 provided with a plug facing the left of the operator. The lengths can be fed in any desired manner or they can be collected from an auxiliary rack R not pertaining to the invention.

[0013] The lengths 3, arranged on the conveyor belt 2, are brought to the working station 4, which will be described hereinafter, to perform the winding-up of the skein, while, in the second working station 6, arranged obliquely on one side of the operator A, the length skein will be bound by a binding tape and ejected into the container 9.

[0014] Figures 3, 4A and 4B show the skeins being formed at the working station 4.

[0015] More specifically, the lengths 3 are arranged by the operator A on the articulated element conveyor belt 2, with the length portion, provided with the plug 31, clamped between a resilient fork 32 and a pair of rollers

33.

[0016] According to a preset operating sequence (see Figure 3), each length 3 deposited on the conveyor belt 2, once the presence of said length has been detected by a photocell, is grasped by a clamp group 40, slidingly supported on a rail 41, and driven to the position 34, shown by a dashed line, in alignment with the skein winding center 42.

[0017] As shown in Figures 4A and 4B, the winding-up of the length is carried out between two pins 43, which can be manually fixed, at a preset distance, on a cross-member 44, coupled to a rotary shaft 45, which member can be vertically driven by a piston 46 and made to rotate by a sleeve 47 in turn driven by a motor 48.

[0018] The winding-up of the skein about the pins 43 offers various advantages, namely i) the possibility of changing the diameter of the skein in a range much broader than that of the winding apparatus known in the art, and ii) that, after having performed the winding, the disengagement of the skein for it to be subsequently taken for binding, is achieved by lowering the pins 43 so as to leave the skein in a compact condition and with its coils orderly arranged.

[0019] The winding-up is started after the clamp group 40, sliding on rail 41, advances by a distance L which can be preset depending on the positions of the pins 43, in order to automatically and uniformly define, for one and the same batch of lengths being worked, the projection of the starting portion from the finished skein on the basis of the distance between the end point of the clamp group 40 stroke and the nearest pins 43.

[0020] When the clamp group 40 has come to a stop at a preset point, the length 3 is clamped and locked onto the winding-up mandrel by means of a pair of clamping means 49, 49', driven by the pistons 50, 50' and turning together with the winding mandrel, in order to obtain a perfectly wound-up skein. With reference to Figure 3, a deviating arm 51 pivoted at 52 is shown, said arm being driven by a small piston 53, which arm, immediately after having released the length 3, grasped by the clamp group 40, deviates, when the pins 43 start to turn anticlockwise, the length portion projecting from the skein into a basket 54 turning together with said pins 43, in order to prevent said length portion from being centrifugally ejected during the winding-up operation, the skein being formed with evenly overlapping coils, since the length being wound up is guided by a pair of small rollers 55 which have facing concave surfaces and which are gradually displaced upwardly in synchronism with the turning of the pins 43.

[0021] Once the formation of the skein has been completed, the second tape binding station 6 comes into action, the operating time of which is coordinated with that of the winding-up station 4 so that in said station 4 can be started the formation of a new skein, while the previously prepared skein is being bound.

[0022] Figures 5, 6, 7 show the arrangement of the

main elements of the tape binding station 6.

[0023] A clamp group 60, slidably supported on the rail 61 (Figure 3), engages with its arms 62 the middle portion of the wound-up skein M and goes back until it is above the recess 64.

[0024] Figure 5 shows that above the recess 64 is transversely arranged a tape of a plastic material 70 delivered from a tape bobbin 72, braked by an arm 73, said tape being fed and held in a stretched condition by a recovery assembly 74.

[0025] The skein M, carried by the clamp 60, is now grasped at its two end portions by a pair of side clamps 66, 66', it is released by the clamp 60 (Figure 6) upon the opening of the arms 62 and it is lowered against the tape 70 which envelops the skein for more than half its cross extension. In order to maintain the skein in a compacted condition, it is made to bear against a flexible tongue 67, arranged on a slider 68, sliding on a rod-free piston 69.

[0026] The side clamps 66, 66', coupled to a common base 66a which can be vertically driven by a piston 66b, are shown in Figure 5 in a raised position and in Figure 6 in a lowered position.

[0027] Figure 7 substantially shows the final step of the winding-up and tape binding process. With reference to Figure 6, two pairs of heated heads 80, 80' are neared one to the other and they perform simultaneously two neighbouring welding operations on the plastic tape, which will then immediately be cut by a blade 82 situated between the welding heads 80, 80', so that the binding tape 84 (see Figure 8) is welded together, while maintaining the wound-up skein in a well compacted condition, while the second welding of the tape 70 will keep it continuous, which tape can be made to advance by the recovering assembly 74, thereby presenting a fresh portion of tape 70 for binding a subsequent skein.

[0028] Upon the opening of the side clamps 66, 66', the slider 68, driven by the rod-free piston 69, will eject the wound-up and bound skein (M) into a container 9, as shown in Figure 1.

[0029] As stated in the introductory clause of the description, the process and machine for implementing said process can be used for winding-up and binding any type of filiform elements, such as mains cords lengths ending with plugs and mating sockets or without these elements, telephone cables or cables for other use, ropes for any applications, and the like.

Claims

1. A process for winding up and binding lengths of filiform elements, such as cables, ropes and the like, in particular mains cords optionally provided with a plug for coupling to a mains network, **characterized** by the following steps of:

a) depositing said lengths onto a movable rack;

b) transferring, step by step, said lengths to a pick-up point controlled by a photocell;

c) grasping and raising each length by means of a movable clamp;

d) positioning said length in a winding-up zone while taking into account that an optional starting portion of the filiform element could project from the skein once the latter has been wound up and bound at its middle portion;

e) retaining said length on a winding mandrel and starting the winding up operation after having introduced the starting portion of said length projecting from said skein into a rotary basket, and forming a skein;

f) grasping said skein at its middle portion by means of a transporting clamp after having removed downwards the winding-up elements;

g) transferring said skein to a tape binding station at the opening of said station, above which a tape of thermo-weldable material is caused to pass;

h) engaging the ends of said skein through two side clamps and opening the arms of the transfer clamp;

i) lowering the skein through the side clamps against a tape of thermo-weldable, optionally thermo-shrinking, material;

j) binding the skein with a single tape layer;

k) welding said tape by means of two pairs of corresponding thermo-welding clamps and forming two tape welded portions at two neighbouring but spaced positions;

l) cutting the tape between said two neighbouring welded portions so as to maintain the tape continuous and disengaging the thus formed bound tape;

m) recovering a portion of the tape simultaneously with the opening of the side clamps and ejecting the tape bound skein into a container.

2. A machine for winding up and binding at its middle portion skeins of filiform element lengths, such as cables, ropes and the like, in particular mains cords provided with a plug for coupling to a mains network, **characterized in that** said machine comprises:

a) a movable rack (2) whereon said rectilinear lengths (3) are deposited, for transferring said lengths step by step to the subsequent grasping step controlled by a photocell;

b) means for grasping and positioning each filiform element length (3), said grasping and positioning means comprising a movable clamp group (40), capable of moving to an end point at a maximum distance from the winding-up zone (4) or, possibly, for a further distance corresponding to the length of an optional filiform

element portion which must project from the finished skein;

c) a length winding-up assembly (43) provided with means (49, 49') for clamping said length and a basket (54) for inserting therein the optional skein projecting portion;

d) clamp group (60) for clamping the skein at its middle portion, after having removed downwards the winding-up elements, and for transferring said skein to a tape binding station in alignment with an opening of a recess (64), above which a tape of thermo-weldable material (70) is caused to pass;

e) means for engaging the ends of a skein, said skein engaging means comprising two side clamps (66, 66'), followed by the opening of the arms of the clamping and transferring group (60);

f) means (66a, 66b) for lowering the skein retaining side clamps (66, 66') against a tape of thermo-weldable, optionally thermo-shrinking material (70) to cause said tape to form a single layer binding enveloping said skein;

g) means for welding said tape (70), comprising two pairs of corresponding welding heads (80, 80'), in order to form two simultaneous welded portions on the tape at two neighbouring but spaced positions;

h) cutting means (82) for cutting said tape between said two neighbouring welded portions;

i) recovering means (74) for recovering a portion of said tape simultaneously with the opening of said side clamps; and

j) ejecting means (68, 69) for ejecting said tape bound skein into a container.

3. A machine according to Claim 2, **characterized in that** said clamp group (40) slides on a rail (41) for a presettable distance (L), depending on the length of a possible starting portion of the filiform lengths (3) projecting from said skein, said length (3) being laid on a path passing through the central axis (42) of the winding-up assembly.

4. A machine according to Claims 2 and 3, **characterized in that** the winding-up assembly comprises a pair of vertical pins (43), symmetrical with respect to the rotary axis (42), the distance of which can be adjusted depending on the length of the filiform lengths and the number of coils of said skein, said pins (43) being supported by a cross-element (44) which can be vertically shifted by a rotary shaft (45) in turn made to rotate by means of a sleeve (47) operated by a motor (48), said pins (43) projecting from the working surface during the winding-up process and being withdrawn so as to disengage the skein at the end of the winding-up process, as well as clamps (49, 49') for clamping the end portion

of said length during the winding-up process.

5. A machine according to Claims 2 to 4, **characterized in that** the pair of pins (43) is encompassed by a cylindrical basket (54), rotating together with the pins (43), for holding in a limited space the extremity of the length (3), optionally projecting from the skein, which could otherwise constitute a danger, or be damaged, under the effect of the centrifugal force, said extremity being deviated into said basket (54) by a deviating arm (51) driven by a piston (53) before the winding-up process is started.

6. A machine according to Claims 2 to 5, **characterized in that** said grasping clamp means comprises a clamp group (60), sliding on a rail (61) arranged obliquely with respect to the rail (41) of the grasping and positioning clamp group (40), in order to transfer the wound skein (M) to the aperture of recess (64) and above a tape of thermo-weldable plastic material (70), arranged transversely to said aperture of recess (64), said tape (70) being supplied by a bobbin (72) and fed in a stretched condition by a recovery assembly (74).

7. A machine according to Claims 2 to 6, **characterized in that** means for engaging the ends of said skein comprise a pair of side clamps (66, 66') arranged in the recess (64) and mounted on a common base (66a) which can be vertically shifted by a piston (66b), said side clamps engaging the ends of the skein (M) carried by the skein grasping clamp group (60), so as to lower said skein against said tape after the arms (62) of the clamp group (60) have released said skein, causing said skein to contact a flexible tongue (67) arranged on a slider (68) of a rod-free piston (69), to improve the compactness of said skein.

8. A machine according to Claims 2 to 7, **characterized in that** between the two pairs of corresponding welding heads (80, 80'), arranged between said flexible tongue (67) and the sliding surface of the thermo-weldable tape (70), is provided a cutting blade (82) in order to cut the welded binding tape (84) of said skein (M), while maintaining the tape (70) continuous, which tape is made to advance for a short portion by the recovery assembly (74).

9. A machine according to Claims 2 to 8, **characterized in that** the skein (M), tied by the binding (84) consisting of said thermo-weldable tape (70), is ejected from the machine (1) by the movement of the slider (68) of said rod-free piston (69), and that it is collected in a container (9).

Patentansprüche

1. Verfahren um Abschnitte fadenförmiger Elemente wie etwa Kabel, Seile und dergleichen, insbesondere aber elektrische, wahlweise mit einem Stecker versehene Anschlusskabel, aufzuwickeln und zu binden, **gekennzeichnet durch** folgende Schritte:

- a) Ablegen der Abschnitte auf einen beweglichen Rost; 10
- b) Schrittweiser, **durch** eine Photozelle gesteuerter Transfer der Abschnitte zu einer Aufnahmestelle;
- c) Fassen und Anheben jedes Abschnittes mittels einer beweglichen Zange; 15
- d) Anordnen des Abschnittes in einer Aufwickelzone, wobei berücksichtigt wird, dass ein wählbarer Teil des fadenförmigen Elementes aus dem Strang herausragen kann wenn dieser einmal aufgewickelt und in seiner Mitte gebunden ist; 20
- e) Halten des Abschnittes auf einem Dorn und Beginn des Wickelprozesses nachdem jener wählbare, aus dem Strang ragende Teil in einem rotierenden Korb eingelegt wurde, und Bildung eines Stranges; 25
- f) Fassen des Stranges in seinem mittleren Teil **durch** eine Transportzange, nachdem die Wickелеlemente abwärts entfernt wurden;
- g) Transfer des Stranges zum Eingang einer Bindestation, über welchem ein thermoschweisbares Band läuft; 30
- h) Einführen des Stranges in zwei seitliche Zangen und Öffnen der Backen an Transportzange; 35
- i) Herablassen des Stranges mittels der seitlichen Zangen, und Annähern an ein Band aus thermoschweisbarem, fallweise **durch** Wärme schrumpfbarem Material;
- j) Binden des Stranges **durch** eine einzige Lage des Bandes 40
- k) Schweißen des Bandes **durch** zwei Paare von einander entsprechenden thermoschweisenden Zangen, um an zwei benachbarten, aber getrennten Stellen zwei geschweisste Teile zu bilden; 45
- l) Durchschneiden des Bandes zwischen den benachbarten, geschweissten Teilen, um den Zusammenhang des Bandes zu erhalten, und entnehmen des zusammengebundenen Bandes; 50
- m) Zurückgewinnung eines Teiles des Bandes unter gleichzeitiger Öffnung der seitlichen Zangen, und Auswerfen des **durch** das Band gebundenen Stranges in einen Behälter. 55

2. Apparat, um Stränge aus Abschnitten fadenförmiger Elemente wie etwa Kabel, Seile und dergleichen,

insbesondere aber mit einem Stecken versehene elektrische Netz-Anschlusskabel aufzuwickeln und in ihrem mittleren Teil zu binden, **dadurch gekennzeichnet, dass** der Apparat folgende Teile aufweist:

- a) ein beweglicher Rost (2) auf welchem gestreckte Abschnitte (3) abgelegt werden um sie Stück für Stück dem darauffolgenden, durch eine Photozelle gesteuerten Greifprozess zuzuführen;
- b) Mittel, um jeden fadenförmigen Abschnitt (3) zu greifen und zu positionieren, wobei diese Mittel eine bewegliche Zangengruppe (40) umfassen die sich bis zu einem in maximalen Abstand von der Aufwickelzone (4) befindlichen Endpunkt bewegen kann, oder möglicherweise über eine grössere Entfernung die der Länge eines wählbaren fadenförmigen Abschnittes entspricht, welcher aus dem fertigen Strang herausragen soll;
- c) eine Aufwickelereinheit (43) mit Mitteln (49, 49') um besagten Abschnitt zu fassen, und mit einem Korb (54) um den fallweise herausragenden Abschnitt wählbarer Länge aufzunehmen;
- d) eine Zangengruppe (60) um den Strang in seinem mittleren Teil zu fassen nachdem die Wickелеlemente abwärts entfernt wurden, und um den Strang einer Bindestation zuzuführen, wo er mit einem Durchgang (64) fluchtet oberhalb welchem ein aus thermoschweisbarem Material bestehendes Band (70) durchläuft;
- e) Mittel, um die Enden eines Stranges aufzunehmen, welche Mittel zwei seitliche Zangen (66, 66') umfassen, und um danach die Backen der Fass- und Transfer-Gruppe (60) zu öffnen;
- f) Mittel (66a, 66b), um die den Strang haltenden seitlichen Zangen (66, 66') auf ein aus thermoschweisbarem, fallweise durch Wärme schrumpfbarem Material bestehendes Band (7) herabzulassen, dergestalt, dass das Band eine einzelne, den Strang zusammenbindende Schicht bildet;
- g) Mittel, um das Band (70) zu schweißen, bestehend aus zwei Paaren von einander entsprechenden Schweissköpfen (80, 80'), um an zwei benachbarten, aber voneinander getrennten, Stellen gleichzeitig zwei geschweisste Stellen zu bilden;
- h) Schneidemittel (82), um das Band zwischen jenen geschweissten Stellen durchzuschneiden;
- i) Rückgewinnungsmittel (74), um gleichzeitig mit dem Öffnen der seitlichen Zangen einen Teil des Bandes zurückzugewinnen; und
- j) Auswurfmittel (68, 69), um den durch ein Band gebundenen Strang in einen Behälter zu

befördern.

3. Apparat nach Anspruch 2, **dadurch gekennzeichnet, dass** die Zangengruppe (40) über eine voreinstellbare Strecke (L) auf einer Schiene (41) gleitet, in Abhängigkeit der Länge eines möglichen Anfangsstückes des aus dem Strang herausragenden, fadenförmigen Abschnittes (3), wobei dieser Abschnitt (3) auf einem Pfad liegt, der durch die Mittelachse (42) der Wickeleinheit geht. 5 10
4. Apparat nach den Ansprüchen 2 und 3, **dadurch gekennzeichnet, dass** die Wickeleinheit ein Paar vertikaler, zur Drehachse (42) symmetrischer Stifte (43) aufweist, deren Abstand in Abhängigkeit der Länge der fadenförmigen Abschnitte und der Anzahl Windungen des Stranges eingestellt werden kann, wobei die Stifte (43) von einem Querträger (44) getragen werden der mittels einer Welle (45) die ihrerseits durch eine mittels eines Motors (48) in Drehung versetzten Muffe (47) angetrieben ist, vertikal verschoben werden kann, und wobei die Stifte (43) während des Wickel-Vorganges aus der Arbeitsfläche hervorragen und am Ende des Aufwickelns eingezogen werden, so dass sie den Strang freigeben, sowie durch Zangen (49, 49') welche das Ende des Abschnittes während des Aufwickelns fassen. 15 20 25
5. Apparat nach den Ansprüchen 2 bis 4, **dadurch gekennzeichnet, dass** das Stiftepaar (43) von einem zylindrischen Korb (54) umgeben ist, der sich zusammen mit den Stiften (43) dreht, um das Ende des fallweise aus dem Strang hervorragenden Abschnittes (3) in einem beschränkten Raum festzuhalten, da es sonst unter dem Einfluss der Fliehkraft eine Gefahr darstellen oder selbst beschädigt werden könnte, wobei dieses Ende vor Beginn des Aufwickelns mittels eines durch einen Kolben (53) angetriebenen Ablenk-Armes (51) in den Korb (54) gelenkt wird. 30 35 40
6. Apparat nach den Ansprüchen 2 bis 5, **dadurch gekennzeichnet, dass** die Mittel zum Greifen der fadenförmigen Abschnitte eine Zangengruppe (60) aufweist, die auf einer Schiene (61) gleitet, welche schräg zur Schiene (41) der beweglichen Greif- und Positionierungs-Zangengruppe (40) verläuft, um den gewickelten Strang (M) zur Öffnung des Durchganges (64) und oberhalb eines quer zu dieser Öffnung verlaufenden Bandes (70) aus thermoschweißbarem Material zu befördern, welches Band von einer Spule (72) aus nachgeliefert und in gestrecktem Zustand in eine Wiedergewinnungseinheit (74) geleitet wird. 45 50 55
7. Apparat nach den Ansprüchen 2 bis 6, **dadurch gekennzeichnet, dass** die Mittel um die Enden des

Stranges aufzunehmen ein im Durchgang (64) angeordnetes Paar von seitlichen Zangen (66, 66') umfasst die auf einem gemeinsamen Sockel (66a) montiert sind der mittels eines Kolbens (66b) vertikal verschoben werden kann, wobei die seitlichen Zangen die durch die fassende Zangengruppe (60) getragenen Ende des Stranges (M) aufnehmen, um den Strang auf das Band herabzulassen nachdem die Backen (62) der Zangengruppe (60) den Strang freigegeben haben, derart dass dieser eine auf einem Schlitten (68) eines pleuellosen Kolbens (69) angebrachte, biegsame Zunge (67) berührt, um die Kompaktheit des Stranges zu erhöhen.

8. Apparat nach den Ansprüchen 2 bis 7, **dadurch gekennzeichnet, dass** zwischen den zwei Paaren von einander entsprechenden Schweissköpfen (80, 80') eine Klinge (82) zwischen der biegsamen Zunge (67) und der Gleitfläche des thermo-schweißbaren Bandes (70) angeordnet ist, um das geschweisste Bindeband (84) des Stranges (M) unter Erhaltung der Kontinuität des Bandes zu schneiden, welches Band mit Hilfe der Wiedergewinnungseinheit (74) ein kurzes Stück vorgerückt wird. 15 20 25
9. Apparat nach den Ansprüchen 2 bis 8, **dadurch gekennzeichnet, dass** der durch die aus thermoschweißbarem Band (70) bestehende Verschnürrung (84) zusammen gehaltene Strang (M) durch die Bewegung des Schlittens (68) des pleuellosen Kolbens (69) aus dem Apparat (1) ausgeworfen und in einem Behälter (9) eingesammelt wird. 30 35

Revendications

1. Procédé pour lover et ficeler des segments d'éléments filiformes tels des câbles, des cordages ou des éléments similaires, en particulier des câbles pour branchement électrique pouvant comporter une fiche pour le raccord au secteur, **caractérisé par** les étapes suivantes:
 - a) pose des segments sur une grille mobile;
 - b) transport un à un des segments vers un emplacement de départ;
 - c) Saisie et levée de chaque segment au moyen d'une pince mobile;
 - d) positionnement du segment dans une zone d'enroulement en tenant compte de ce qu'une partie arbitraire de l'élément filiforme peut dépasser de l'écheveau une fois celui-ci lové et ficelé en son milieu;
 - e) maintient du segment sur un mandrin d'enroulement et début de l'enroulement après introduction de ladite partie arbitraire dans une corbeille rotative, et formation d'un écheveau;
 - f) saisie de l'écheveau en son milieu par une

pince de transport, après avoir éloigné le dispositif d'enroulement vers le bas;

g) transfert de l'écheveau vers une embouchure d'une station de ficelage par ruban, embouchure au-dessus de laquelle passe un ruban d'un matériau soudable à chaud; 5

h) saisie des extrémités de l'écheveau par deux pinces latérales et ouverture de la pince de transport;

i) abaissement de l'écheveau par les pinces latérales vers un ruban de matériau soudable à chaud et éventuellement rétrécissant à la chaleur; 10

j) ficelage du ruban par un seul tour;

k) soudure du ruban à l'aide de deux paires de pinces de soudure correspondantes et formation de deux parties de ruban soudées, voisines mais séparées; 15

l) coupe du ruban entre les deux parties soudées voisines, de manière et à dégager le ruban maintenu fermé; 20

m) récupérer une partie du ruban et simultanément ouvrir les pinces latérales et éjecter l'écheveau ficelé par le ruban dans un conteneur. 25

2. Appareil pour lover et ficeler en son milieu un écheveau formé par un segment d'un élément filiforme tel un câble, un cordage ou un élément similaire tel un câble de branchement électrique muni d'une fiche pour être connecté au secteur, **caractérisé en ce qu'il comprend:** 30

a) une grille mobile (2) sur laquelle on allonge les segments (3) pour les transférer un à un vers une opération de saisie contrôlée par une cellule photo-électrique; 35

b) des moyens pour saisir et positionner chaque segment filiforme (3), ces moyens comportant un groupe de pinces mobiles (40) capables de se mouvoir jusqu'à un terminus situé à distance maximale de la zone d'enroulement (4) ou éventuellement à une distance supérieure correspondant à la longueur d'une partie optionnelle de l'élément filiforme devant dépasser de l'écheveau une fois celui-ci achevé; 40

c) un dispositif d'enroulement (43) comportant des moyens (49, 49') pour saisir le segment, ainsi qu'un panier (54) pour y déposer la partie dépassant éventuellement de l'écheveau; 45

d) un groupe de pinces (60) pour saisir l'écheveau en son milieu après l'éloignement vers le bas du dispositif d'enroulement et pour transférer l'écheveau vers une station de ficelage par un ruban, de façon à aligner l'écheveau avec l'embouchure d'un évidement (64) au-dessus duquel passe un ruban de matériau (70) soudable par chaleur; 50

e) des moyens pour engager les extrémités de l'écheveau, ces moyens comportant deux pinces latérales (66, 66'), et pour ensuite ouvrir les mâchoires du groupe de saisie et de transfert (60);

f) des moyens (66a, 66b) pour abaisser les pinces latérales (66, 66') de saisie de l'écheveau vers un ruban (70) d'un matériau soudable à chaud et éventuellement rétrécissant à la chaleur, pour former avec ce ruban un seul tour entourant l'écheveau;

g) des moyens pour souder le ruban (70), ces moyens comportant deux paires de têtes de soudure correspondantes (80, 80'), afin de former simultanément deux portions de ruban soudées en deux emplacements voisins mais séparés;

h) des moyens de découpage (82) pour couper le ruban entre les deux portions soudées voisines;

i) des moyens de récupération (74) pour récupérer une partie du ruban au moment où l'on ouvre les pinces latérales; et

j) des moyens d'éjection (68, 69) pour éjecter dans un conteneur l'écheveau ficelé par le ruban. 55

3. Appareil selon la revendication 2, **caractérisé en ce que** le groupe de pinces (40) glisse sur un rail (41) sur une distance prééglable (L) dépendant de la longueur d'une éventuelle partie antérieure du segment filiforme (3) dépassant de l'écheveau, ce segment étant placé sur une trajectoire passant par l'axe central (42) du dispositif d'enroulement.

4. Appareil selon les revendications 2 et 3, **caractérisé en ce que** le dispositif d'enroulement comporte une paire de broches verticales (43) symétriques par rapport à l'axe de rotation (42) et dont l'espacement peut être ajusté en fonction de la longueur du segment filiforme et du nombre de tours de l'écheveau, ces broches (43) reposant sur une traverse (44) pouvant être déplacée verticalement au moyen d'un axe rotatif (45), lui-même mis en rotation par un manchon (47) actionné par un moteur (48), les broches (43) s'étendant à partir de la surface de travail pendant l'enroulement et étant ensuite rétractées de manière à libérer l'écheveau à la fin de l'opération d'enroulement, ainsi que des pinces (49, 49') pour saisir l'extrémité du segment pendant l'enroulement.

5. Appareil selon les revendications 2 à 4, **caractérisé en ce que** la paire de broches (43) est entourée par un panier cylindrique (54) tournant avec les broches (43) pour maintenir dans un espace restreint l'extrémité de la partie (3) pouvant dépasser de l'écheveau et qui pourrait sans cela présenter un danger

en être endommagée sous l'effet de la force centrifuge, cette extrémité étant déviée avant le début de l'enroulement vers l'intérieur du panier (54) par un bras directeur (51) actionné par un piston (53).

5

6. Appareil selon les revendications 2 à 5, **caractérisé en ce que** les moyens pour saisir les segments comprennent un groupe (60) de pinces glissant sur un rail (61) oblique par rapport au rail (41) du groupe de pinces (40) de saisie et de positionnement, afin de transférer l'écheveau lové (M) vers l'embouchure de l'évidement (64), au-dessus d'un ruban (70) en un matériau soudable à chaud disposé transversalement à l'embouchure de l'évidement (64), le ruban étant débité par une bobine (72) et délivré sous tension par un dispositif de récupération (74). 10 15

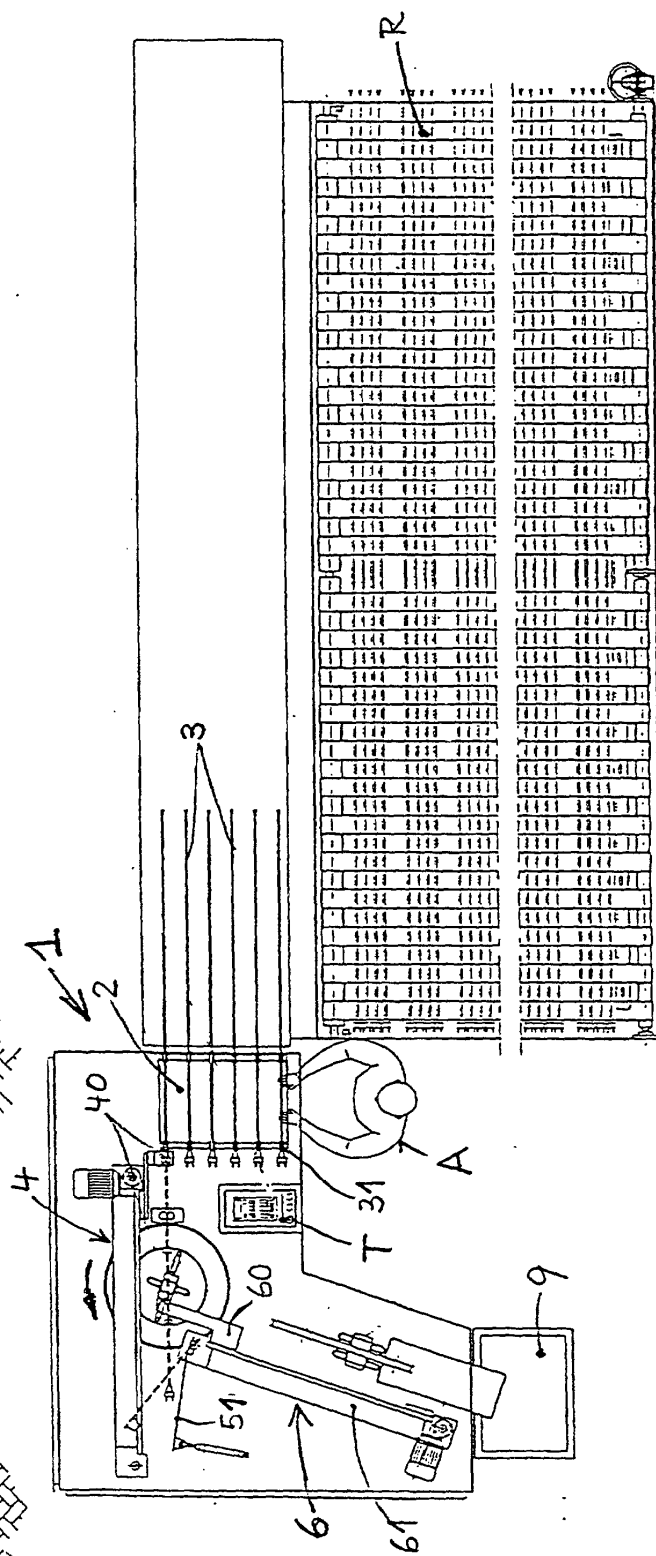
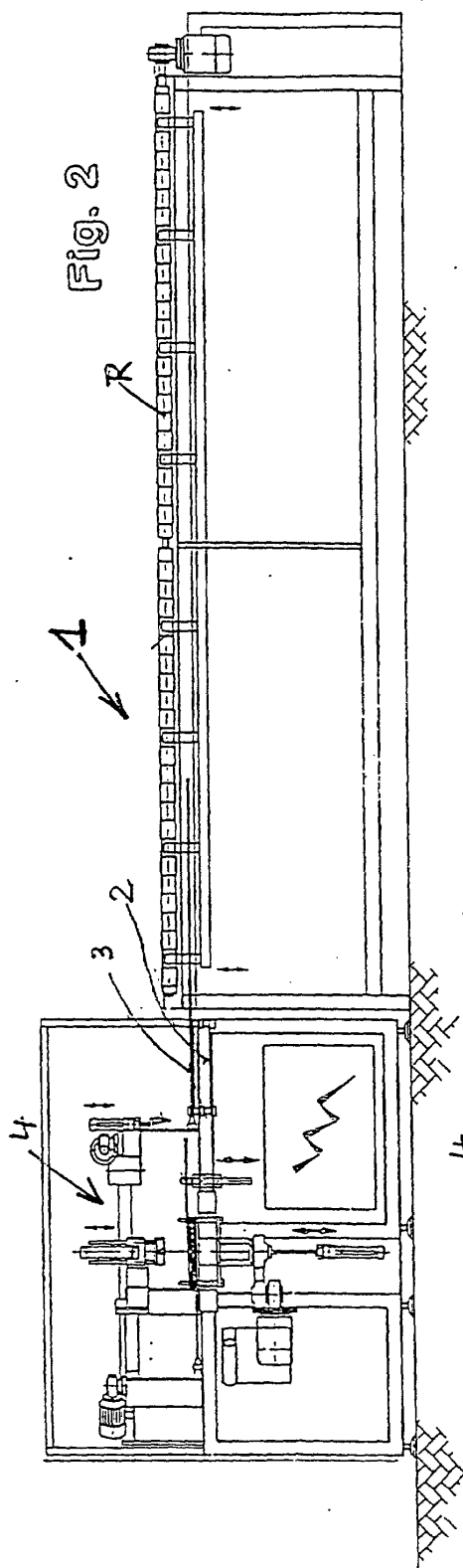
7. Appareil selon les revendications 2 à 6, **caractérisé en ce que** les moyens pour engager les extrémités de l'écheveau comportent une paire de pinces latérales (66, 66') disposées dans l'évidement (64) et montées sur un socle commun (66a) pouvant être déplacé verticalement par un piston (66b), ces pinces saisissant les extrémités de l'écheveau (M) portées par le groupe de pinces (60) pour abaisser l'écheveau vers le ruban une fois que les mâchoires (62) des pinces du groupe (60) ont lâché l'écheveau, le mettant ainsi en contact avec une lame flexible (67) disposée sur un coulisseau (68) d'un piston (69) sans bielle, afin d'améliorer la compression de l'écheveau. 20 25 30

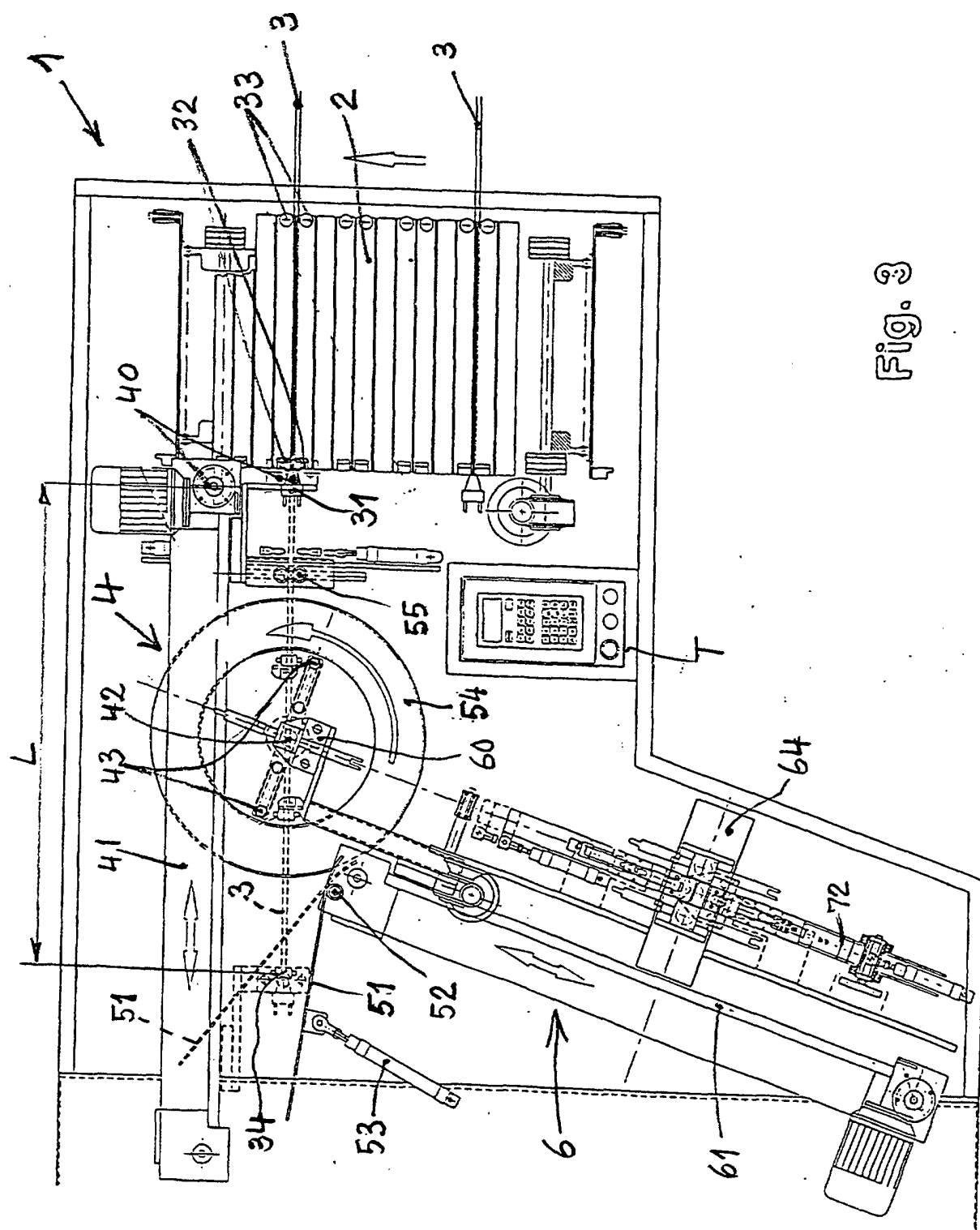
8. Appareil selon les revendications 2 à 7, **caractérisé en ce qu'il** comporte une lame tranchante (82) disposée entre les deux paires de têtes de soudure correspondantes (80, 80') agencées entre la lame flexible (67) et la surface de glissement du ruban (70) soudable à chaud, afin de couper le ruban soudé de l'écheveau (M) tout en sauvegardant la continuité du ruban (70), celui-ci avançant alors d'un petit intervalle sous l'action du dispositif de récupération. 35 40

9. Appareil selon les revendications 2 à 8, **caractérisé en ce que** l'écheveau (M) ficelé par l'attache (84) formée par le ruban soudable à chaud (70) est éjectée de l'appareil (1) par le mouvement du coulisseau (68) du piston sans bielle (69), et **en ce que** l'écheveau est collecté dans un conteneur (9). 45 50

50

55





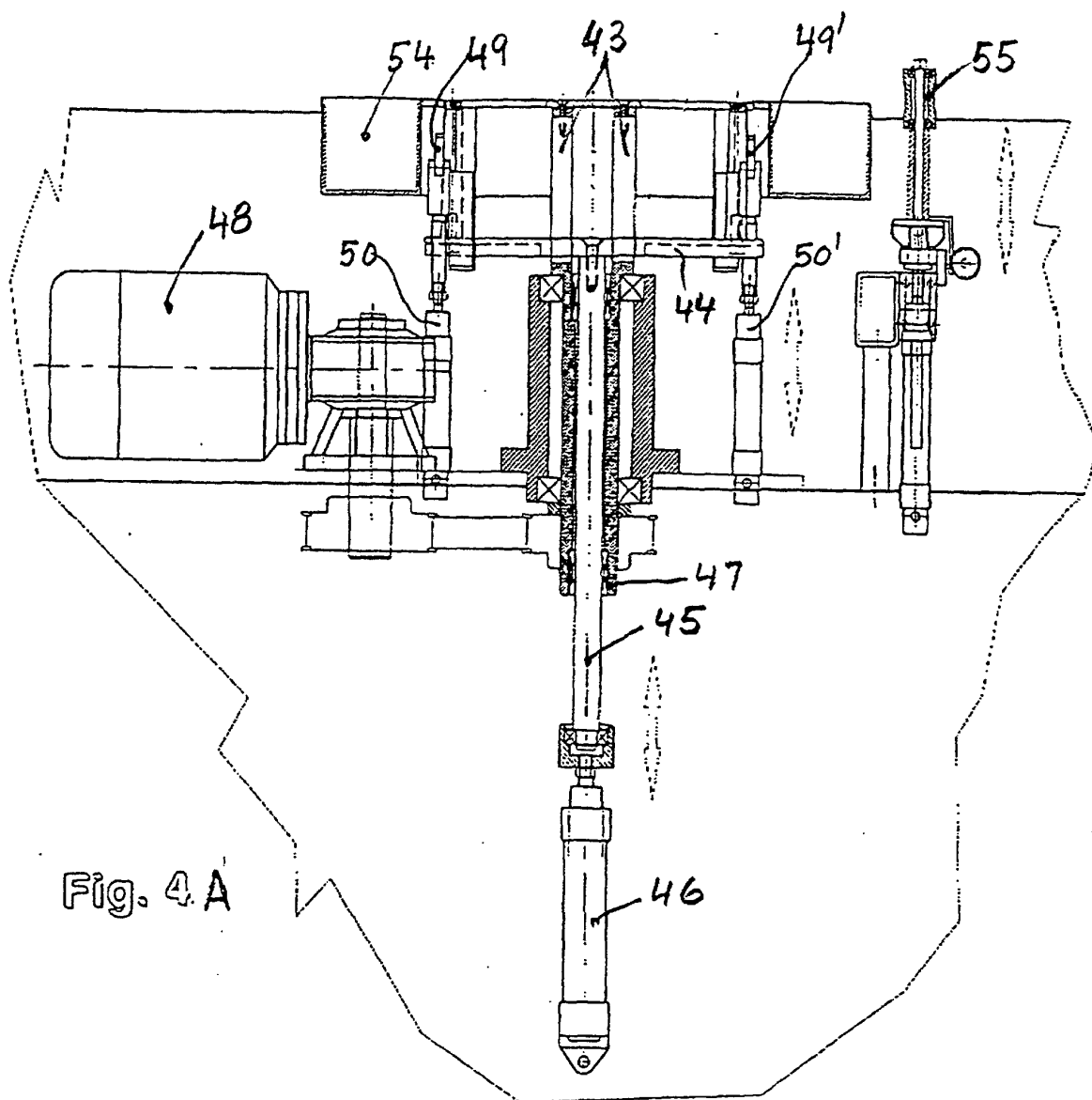


Fig. 4A

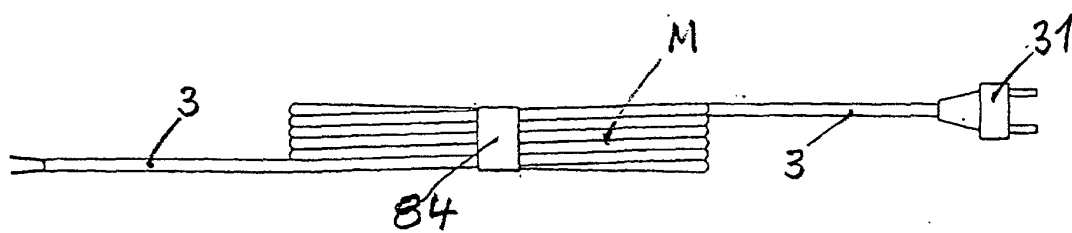


Fig. 8

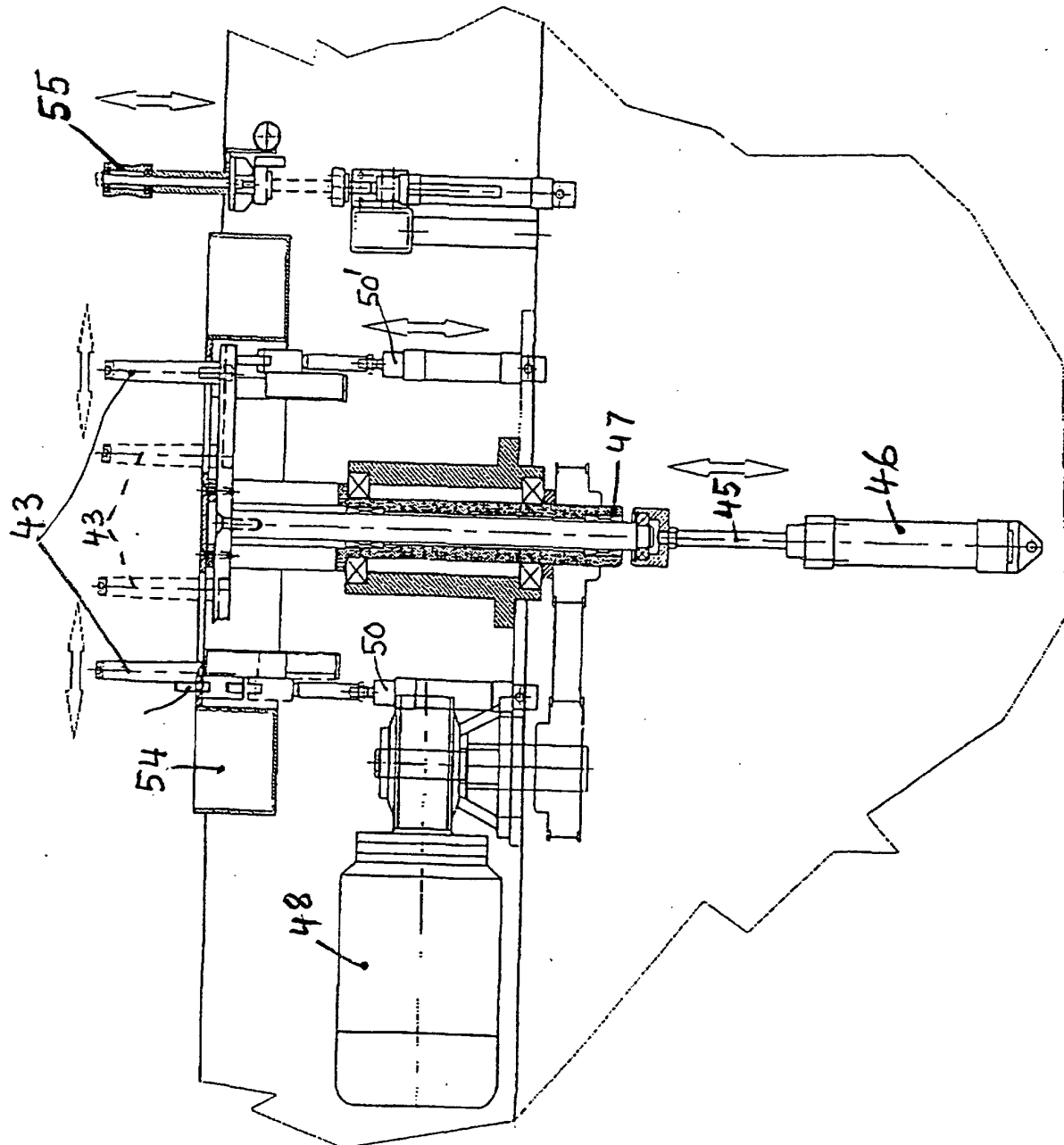


Fig. 4B

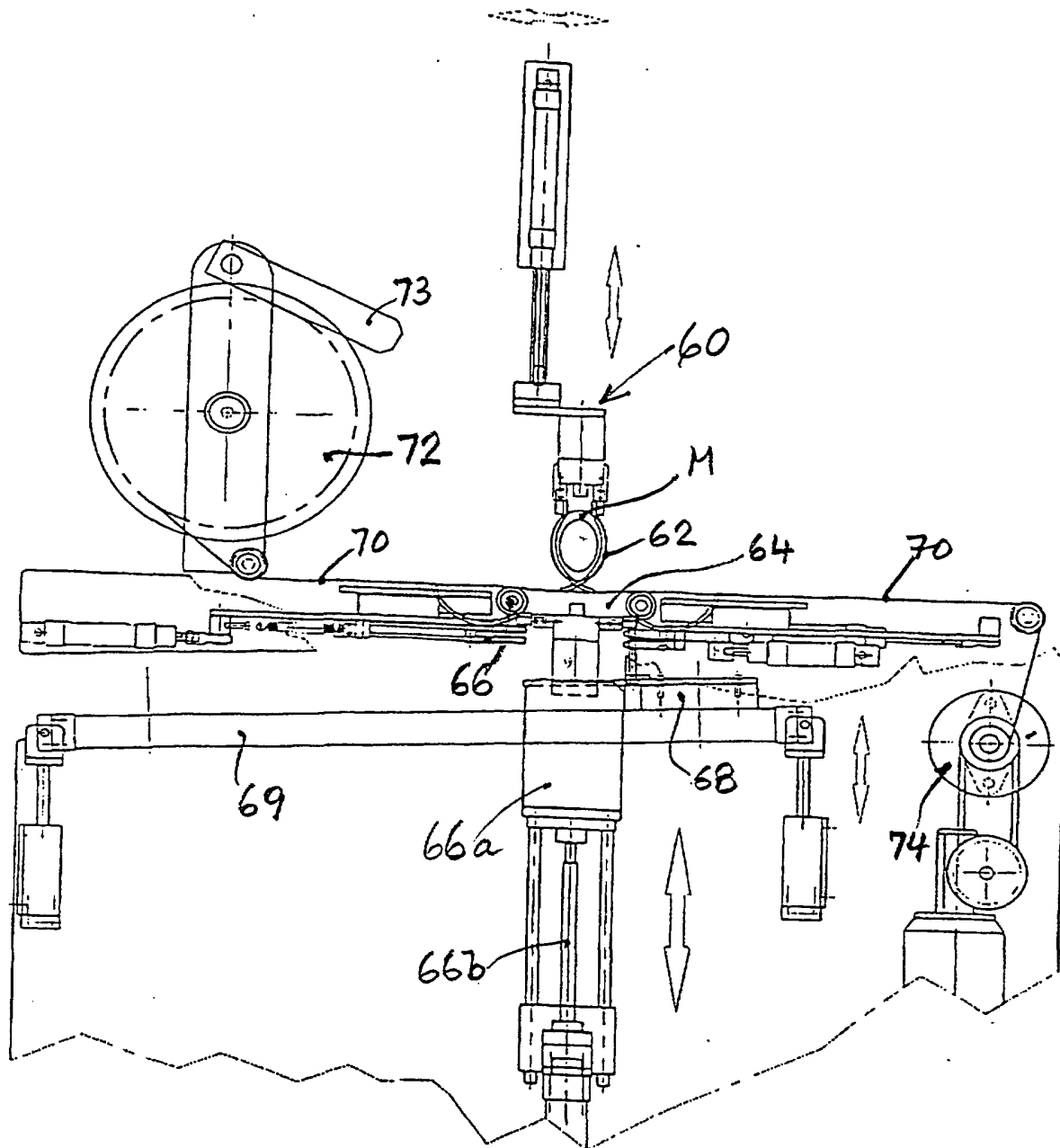


Fig. 5

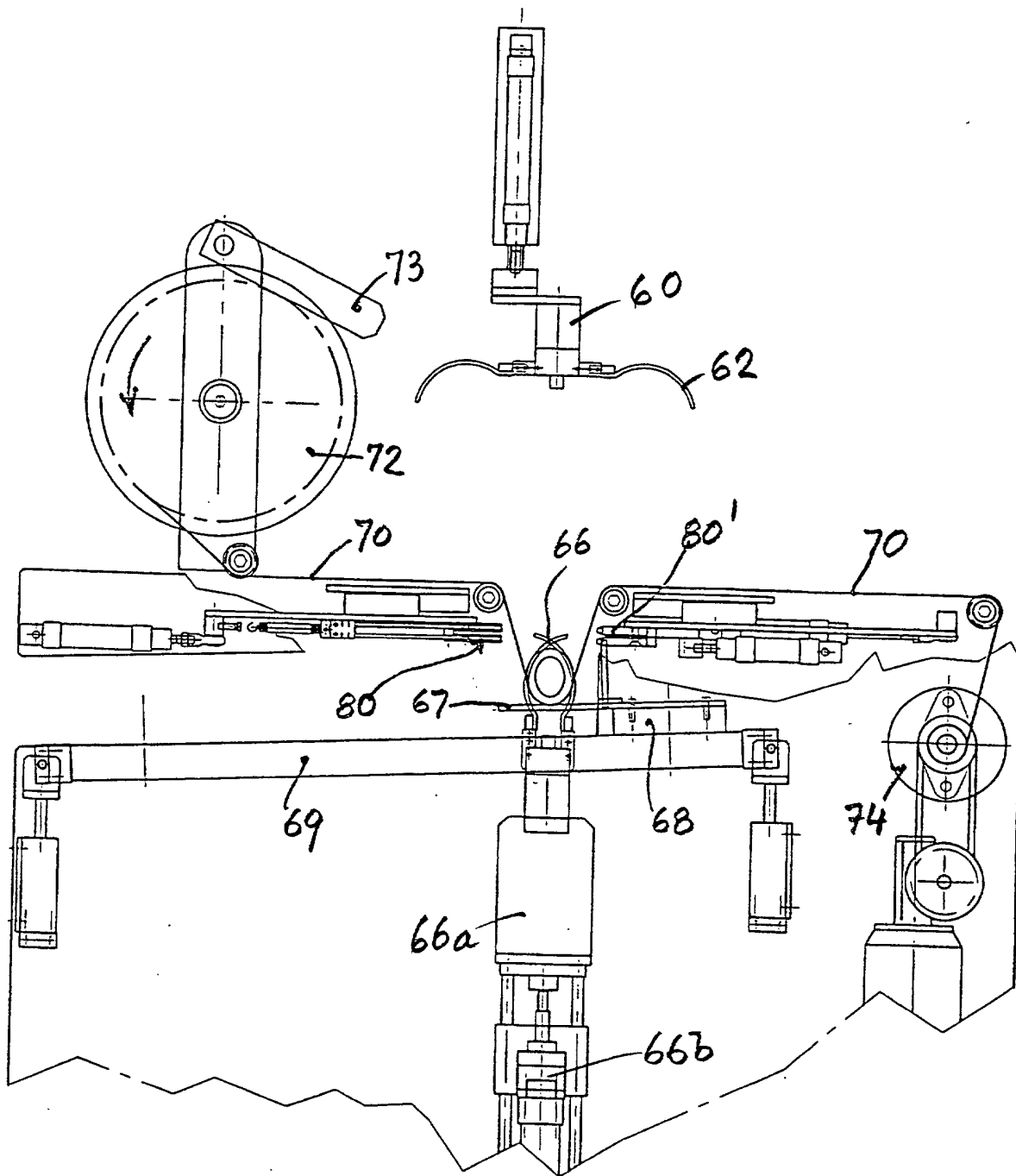


Fig. 6

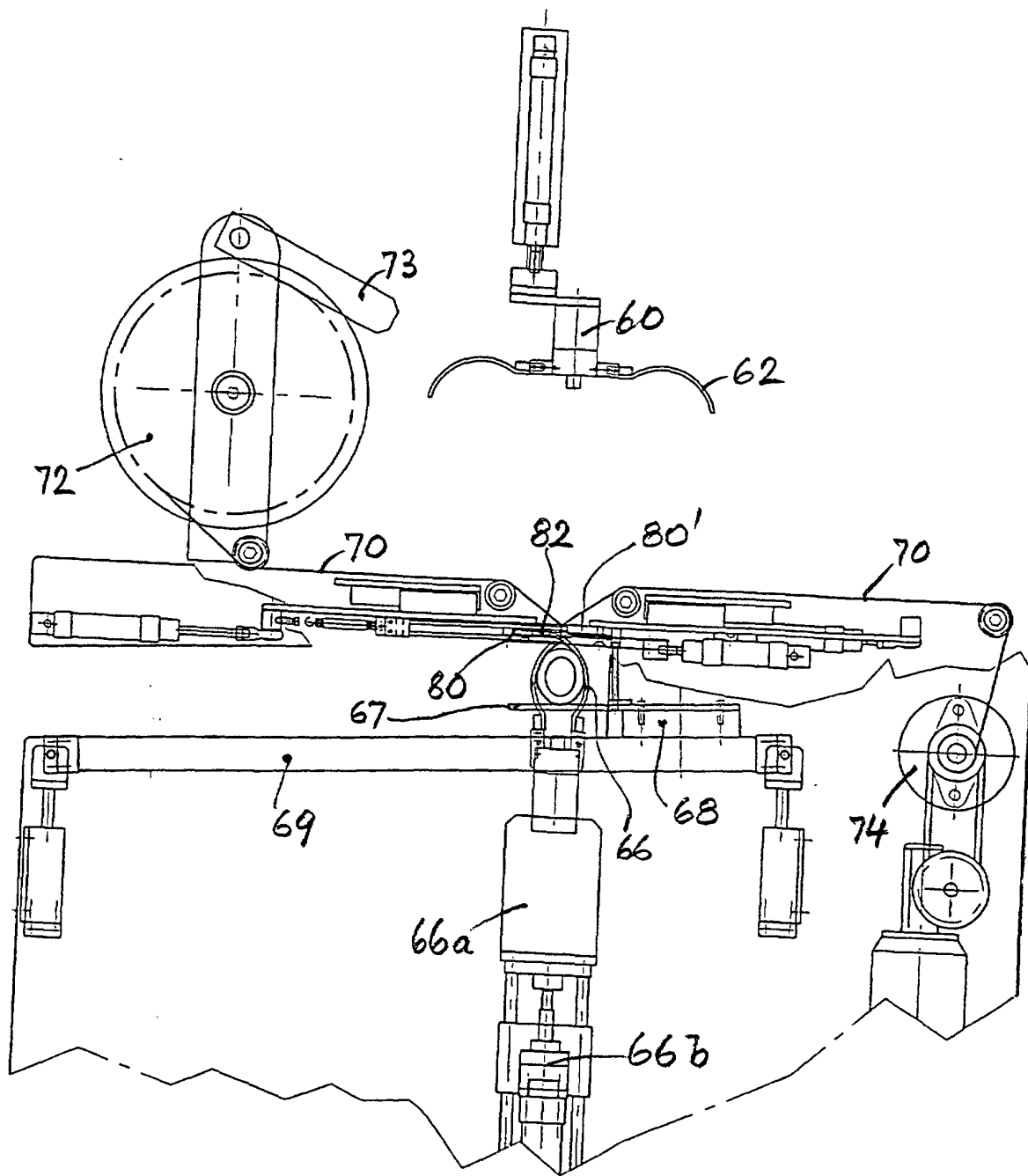


Fig. 7