(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 645 200 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
**28.01.1998 Bulletin 1998/05**

(51) Int. Cl.[6]: **B21C 1/30**

(21) Application number: **94114476.8**

(22) Date of filing: **14.09.1994**

# (54) Machine to draw bars

Maschine zum Ziehen von Stangen

Machine d'étirage des barres

(84) Designated Contracting States:
**AT BE DE ES FR GB IT SE**

(30) Priority: **29.09.1993 IT US930200**

(43) Date of publication of application:
**29.03.1995 Bulletin 1995/13**

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## Description

This invention concerns a machine to draw bars, as set forth in the preamble of the main claim.

Such a bar drawing machine consists substantially of a drawing assembly which comprises a pair of opposed contrarotating chains of the type disclosed in EP-A-548723, for instance, and is positioned downstream of a drawplate or die.

Such a drawing machine is applied in the field of continuous straight drawing of metallic bars or tubes.

Drawing machines of the state of the art consist of an element called a die to reduce the section of the product being drawn and of means which are positioned downstream of the drawplate die and are suitable to carry out lengthwise drawing of the bar to be drawn.

An initial segment of the bar to be drawn is prepared with a cross-section smaller than the size of the die, so that in an initial step this segment can be passed through the die and be attached to the drawing assembly.

The continuous drawing means comprising the drawing assembly generally consist of a device comprising two opposed chains or tracks, which consist of a series of links to which are fitted the blocks or grippers that act on the two opposite sides of the segment of bar which has already been passed through the die.

These chains are set in continuous rotation and cooperate with rigid guides; they clamp the drawn bar and draw it in a straight line.

The embodiments of the state of the art often entail the drawback of not being able to ensure a perfect clamping of the bar between the links of the chains, particularly after prolonged use of the drawing machine.

This situation often leads to sliding of the bar between the chains and therefore involves variations of the speed of feed of the bar as compared to the peripheral speed of the chains, thus causing quick and premature wear of the clamping grippers.

Moreover, the drawing devices of the state of the art cannot be adapted quickly to changes of sizes of the section of the drawplate.

The state of the art includes devices suitable to adjust the distance between centres of the drawing chains in relation to the drawing axis so as to ensure efficient clamping of the bar to be drawn during each working step.

US-A-2,797,798 discloses a drawing assembly in which the adjustment of the distance between centres of the chains is carried out by means of a first mechanical pressure applied directly to the tracks and a second pressure with use of a fluid, this second pressure too being applied directly to the tracks. The mechanical pressure is performed by using wedge means, which are brought to apply pressure to the tracks.

This embodiment is very complex from constructional and working points of view, is bulky and also acts substantially on the axes of the sprocket wheels about which the chains rotate. Moreover, the double system of acting mechanically and with a fluid, whereby each system acts on separate parts of the machine, creates lack of homogeneity of actuation and problems of control, adjustment and coordination.

EP-A-433767 discloses a drawing assembly for a drawing machine in which the device to adjust the distance between centres of the chains acts directly on the plates bearing the chains and on their position. This document includes a motor which drives a pair of threaded shafts associated with the respective chains by means of respective nut screw assemblies and bush assemblies.

When adjustment is necessary, the chain is brought to its position by adjusting, at a right angle to the drawing axis by means of the threaded shafts, the position of the chains in relation to the drawing axis.

This system, although very effective in principle, has been found, when applied, to be not strong and reliable enough and leads to problems of wear and requires constant and continuous maintenance, above all when the performance required of the machine is at its upper limit. Moreover, this system does not provide for the ability to adjust in a differentiated manner separate zones of the drawing path within the drawing assembly.

Furthermore, in the drawing machines of the state of the art the adjustment is established on the basis of the nominal diameter of the bar and is possibly corrected only when the drawing section is changed or when obvious difference are found between the actual diameter and the nominal diameter.

Besides, the drawing machines of the state of the art entail shortcomings as regards the method of readying the initial segment with a reduced cross-section.

In fact, the bar to be drawn should include a segment of a cross-section such that it can be passed through the drawplate die and is long enough to be attached efficiently to the drawing assembly of the drawing machine.

In the state of the art the leading end segment of the bar with a reduced cross-section is generally readied in two steps. A first auxiliary operation carried by a suitable machine for sharpening to a point prepares a first leading pointed segment of a modest length.

This leading segment is threaded through the die and the bar is then thrust through the die until a segment of a reduced cross-section and of the required length has been prepared, as is disclosed in DE-A2.758.137 and FR-A-942.599, for instance.

In this case the quality of the segment with a reduced cross-section prepared by being thus thrust is poor and this segment has to be eliminated from the finished product. As the leading segment with a reduced cross-section may reach a length of two metres of more, a great waste of material is involved.

Moreover, a plurality of operations is often required to obtain the required length of the leading segment with

a reduced cross-section without exceeding the combined bending and compressive stresses which the material can withstand.

Furthermore, the thrust applied to the bar requires a force which has an effect on the power installed on the machine.

The document US-3,945,547 shows a drawing assembly composed of two opposed facing chains between which the tubular bar to be drawn is inserted.

These chains consist of a plurality of drawing elements, each of which has at the forward part a gripper element made of wear-resistant material which acts on the tubular bar, and at the rear part a toothed element which engages on the cog wheel which drives the chain.

US'547 teaches to include, inside each of the gripper elements, a permanent magnet which keeps the gripper element and the toothed element joined together, so as to allow a quick and easy substitution of the gripper elements.

Moreover, US'547 includes spring means suitable to give resilient contrast to the chains when they grip the bar to be drawn, and stationary means to define and set the initial reciprocal position of the chains.

This document does not include means to adjust, both continuously and during the drawing process, the locking pressure of the chains on the bar to be drawn according to the requirements identified during the process.

Nor does the document teach to monitor, both continuously and during the drawing process, the drawing force exerted on the bar to be drawn in order to adjust accordingly the locking pressure of the chains.

Furthermore, the document does not teach to act on the torque of the motor driving the chains according to the variation in the locking pressure of the chains.

The present applicants have designed, tested and embodied the present invention to overcome the shortcomings of the state of the art and to achieve further advantages.

The purpose of the invention is to provide a drawing machine in which the adjustment of the distance between centres of the drawing chains or tracks according to variations in the diameter of the bar being processed or in the section of the die can be achieved substantially with. one single operation with very simple methods.

Another purpose of the invention is to be able to adjust the force of closure of the chains substantially continuously according to the drawing force which is measured at the drawplate and to which the bar is subjected.

Yet another purpose of the invention is to produce on a bar to be drawn a long enough segment of a reduced cross-section by using the die itself and thus without requiring external auxiliary operations which impair the quality of the segment having a a reduced cross-section.

A further purpose of the invention is to achieve this reduction of cross-section by drawing and not by thrusting.

The present invention is set forth and characterized in the main claim, while the dependent claims describe embodiments of the apparatus according to the invention.

The attached figures are given as a non-restrictive example and show a preferred embodiment of the invention as follows:-

- Fig.1 shows a plan view of a horizontal section of the drawing assembly of the drawing machine according to the invention;
- Fig.2 shows a section along the line A-A of Fig.1;
- Fig.3 shows a section along the line B-B of Fig.1;
- Fig.4 is a side view of a segment of a chain of the drawing assembly employed in the drawing machine according to the invention;
- Fig.5 is a front view in an enlarged scale of one of the clamps according to the invention;
- Fig.6 is a side view of the drawing machine according to the invention;
- Fig.7 is a plan view of the drawing machine according to the invention;
- Fig.8 shows in an enlarged scale a section of the detail F of Fig.6;
- Figs.9 show the steps of the method to produce the segment with a reduced section according to the invention;
- Fig.10 shows a tract of the series of idler rolls cooperating with the chain according to the invention;
- Fig.11 shows a section along the line C-C of Fig.10;
- Fig.12 shows a section along the line D-D of Fig.4;
- Fig.13 shows a section along the line E-E of Fig.4.

A drawing machine 10 shown as a whole in Fig.6 comprises a drawing assembly 11 positioned downstream of a drawplate 12 in the direction of feed of bars 14 to be drawn.

The drawing assembly 11 is of the type disclosed in EP-A-548723 and comprises two opposed, contrarotating chains 13-113 arranged on the same plane in the vicinity of the drawing axis 15.

The chains 13-113 rotate about respective sprocket wheels 16 and face each other along a segment which defines the drawing path within the drawing assembly 11 along the drawing axis 15.

Each of the chains 13-113 consists of a plurality of links 44; these links 44 include at one end a male element 54 and at their other end a female seat 55, which cooperates with the coordinated male element 54 of the adjacent link 44 (see Fig.12).

The links 44 are connected together by small lateral plates 52 arranged at each side of the links 44 and fixed to connecting pivots 56 of the links 44.

The connecting pivots 56 are positioned at a substantially intermediate position symmetrical in relation

to the link 44 in question. For the sake of convenience of illustration the small lateral plates 52 are shown with lines of dashes in Fig.4.

According to the disclosure of EP-A-548723 the chains 13-113 cooperate with respective stationary rigid guides 43 in producing by interaction a pressure of closure, perpendicular to the drawing axis 15, on the bar 14 to be drawn.

A series of idler rolls 38 installed in a succession of articulated cages 25 is included between the chains 13-113 and the respective rigid guides 43; these idler rolls 38 in the drawing zone are positioned between the links 44 of the respective chain 13-113 and the respective rigid guide 43 so as to reduce friction.

In fact, the interaction between the rigid guide 43 and the chain 13-113 in the drawing zone has to cause the necessary pressure of closure against the bar 14 to obtain the drawing thereof; thus the abrasive friction generated between the rigid guide 43 and the link 44 is often very great.

The idler rolls 38 cooperate with the inner surface of the respective chains 13-113 and are moved by a drawing action of the links 44 so that they move at a speed which is half of that of the chains 13-113.

The series of idler rolls 38 and chains 13-113 on leaving the drawing zone proceed independently along their paths about their axes of rotation.

In Fig.10 the series of idler rolls 38 with their respective articulated linked cages 25 is shown in an enlarged scale in greater detail.

Fig.11 shows a section of two of the articulated linked cages 25.

The articulated linked cage 25 consists of a substantially square or rectangular frame 36 consisting of two half-links 36a-36b connected along their axes 37 so as to enable two rolls 38 to be inserted in this case.

The frame 36 has a substantially H-shaped cross-section (Fig.13).

The rolls 38 may be of a solid type or, according to an evolutive variant, of a resilient type.

The linked cages 25 are connected together by pivots 39 which can oscillate partly within their seats to ensure that one linked cage 25 can rotate in relation to the adjacent cage 25.

The rolls 38 have the purpose of apportioning correctly the pressure necessary between the rigid guide 43 and the respective chains 13-113 for the drawing action; that pressure is discharged at a right angle to the rigid guide 43 and substantially at the centre line thereof.

Half-clamps 45 are fitted to the links 44 of the upper chain 13 and cooperate with mating half-clamps 45 fitted to the links 44 of the lower chain 113 so as to grip the bar 14 to be drawn.

The half-clamps 45 are anchored to the respective links 44 by making the dovetail profile 48 of the links 44 cooperate with the inclined-plane profile 51 of the half-clamps 45.

The links 44 include means for the quick attachment and release of the relative half-clamps 45. In this case the quick attachment and release means consist of lateral catches 61 which secure the respective half-clamp 45 in position; at least one of the two lateral catches 61 includes resilient release means such as a pin 62, with a spring for instance.

The half-clamps 45 include a hollow 49, which in this case is semi-circular and has a profile shaped according to the profile of the bar being processed, and also include lead-in bevels 50 to assist entry and exit of the bar 14 and to facilitate the initial gripping and release of the bar 14 to be drawn (Fig.5).

The chains 13-113 are installed on respective upper 27 and lower 127 supporting plates, or track-holders, at the ends of which are fitted the sprocket wheels 16.

The drawing assembly 11 includes means to adjust the distance between centres of the chains 13-113 in relation to the drawing axis 15. In particular, the drawing assembly 11 comprises a downstream adjustment assembly 59a and an upstream adjustment assembly 59b considered in relation to the direction of drawing 60.

This adjustment of the distance between centres is required, in the step of starting the drawing for instance, so as to obtain the insertion and clamping of a new bar 14 to be drawn without any risk of collisions or impacts.

The adjustment has the further purpose of adapting the drawing assembly 11 to variations in size of the diameters of the bars 14 and of ensuring a constant pressure of closure of the chains 13-113 according to the drawing force measured at the drawplate 12.

The adjustment is performed by acting directly on the upper 27 and lower 127 supporting plates and thus adapting and adjusting the position of the whole structure according to the working requirements.

In this case (Figs.1 and 2) each supporting plate 27-127 of the chains 13-113 comprises two lodgement seats 58 associated respectively with respective supporting pivots 28-128. Each pivot 28-128 is associated eccentrically with a relative cylindrical toothed wheel 30-130 by means of a respective small actuation shaft 29.

In particular, there are a left upper toothed wheel 30a, a right upper toothed wheel 30b, a left lower toothed wheel 130a and a right lower toothed wheel 130b.

The left upper and lower pivots 28a and 128a together with the respective small actuation shafts 29 and left upper and lower toothed wheels 30a and 130a form the downstream adjustment assembly 59a, while the right upper and lower pivots 28b and 128b together with the respective small actuation shafts 29 and right upper and lower toothed wheels 30b and 130b form the upstream adjustment assembly 59b.

All the cylindrical toothed wheels 30-130 are connected together kinematically in this case, or directly, or by means of a gearwheel 31.

Actuation of the toothed wheels 30-130 in this case

is performed by two hydraulic cylinder/piston actuators 32. These hydraulic actuators 32 in this case adjust the pressure of closure of the chains 13-113 against the bar 14 to be drawn according to the drawing force measured on the drawplate 12.

For this purpose a toric load cell 33 is included on the base plate 34 supporting the drawing assembly 11 substantially in cooperation with the position of abutment of the drawplate 12 in its normally drawing position 12b.

During the drawing steps the load cell 33 governs a unit 57 actuating and controlling the hydraulic actuators 32 and establishes the variation of the pressure of closure of the chains 13-113 according to the drawing force measured on the drawplate 12. To be more exact, the load cell 33 measures the strength of the pressure with which a support 47 of the die 46 of the drawplate 12 is drawn against an abutment ring 42 placed facing the load cell 33 on the base plate 34 (Fig.8).

When the hydraulic actuators 32 are actuated, all the four toothed wheels 30-130 are set in rotation. Owing to the eccentric nature of the connection between the supporting pivots 28-128 and the respective toothed wheels 30-130 the rotation is translated into a distancing or approach of the chains 13-113 away from or towards each other.

In fact, the actuation of the toothed wheels 30-130 causes, in one direction or the other, the respective raising or lowering of the upper supporting plates 27 and therefore the whole upper structure and also the corresponding lowering or raising of the lower supporting plates 127 and therefore the whole lower structure.

According to a variant the gearwheel 31 can be disconnected, thus permitting an adjustment differentiated as between one side and the other side of the chains 13-113.

According to the invention at least one eccentric pivot 28 or 128 includes a lever 53 which cooperates with an adjustable stop 35 to govern maximum closure of the chains 13-113.

According to the invention the bars 14 are fed to the drawing machine 10 with a small leading end segment 24 having a reduced cross-section such as to be able to pass through the die 46.

This segment 24 of a reduced corss-section has a length sufficient to enable the segment 24 to be clamped by grippers 17 located immediately downstream of the drawplate 12 when the drawplate 12 is in its normal drawing position 12b (shown with lines of dashes in Fig.6).

The grippers 17 are immovably installed on the base plate 34 to which the drawing assembly 11 is fitted. The grippers 17 are in their open position (Fig.9) when the bar 14 is inserted.

When the segment 24 of a reduced cross-section has passed through the drawplate 12, the grippers 17 are closed and keep the bar 14 clamped (Fig.9b).

According to the invention the drawplate 12 is fitted to a carriage 18 able to move along the drawing axis 15 in relation to the base plate 34. The carriage 18 is installed on cross members 19-20 which are solidly fixed to a platform 21, which can be displaced axially along the drawing direction by action of a first jack 22.

When the bar 14 has been firmly clamped by the grippers 17 brought to their position of closure by a second jack 23 owing to their contact with wedge-shaped surfaces 41 (Fig.8), the first jack 22 is actuated.

The die-holder carriage 18 is thus retracted in the direction of backward drawing to produce a required segment of bar of a reduced cross-section, this cross-section being equal to the cross-section to be drawn.

The backward displacement of the drawplate 12 is carried out along a travel equal to "l" in this case. The length "l" corresponds substantially to the length required for a segment 40 of a reduced cross-section able to ensure an efficient gripping by the drawing assembly 11 and therefore to achieve excellent drawing conditions.

When the drawplate 12 has reached the end of its upstream travel, the grippers 17 are opened, the first jack 22 is actuated in the reverse direction and the drawplate 12, drawing the bar 14 with it, is brought back towards the drawing assembly 11.

Pincers fitted to the die-holder carriage 18, for instance, may be included and be actuated on the bar 14 in this step.

The drawplate 12 with the die 48 is moved to rest on the base plate 34 against the abutment ring 42 in the normal drawing position 12b.

The downstream segment 40 made by backward drawing of the bar 14 is positioned between the chains 13-113 of the drawing assembly 11.

The drawing machine 10 is now ready to start the drawing operation.

## Claims

1. Machine for drawing bars, comprising a drawing die assembly and an associated drawing assembly (11), the drawing assembly comprising two endless chains (13,113) installed on a respective upper (27) and lower supporting plates (127) and disposed on either side of a drawing path, each chain comprising a series of links (44) fitted with gripper blocks (45) for clamping the drawn bar by acting on the two opposite sides of the bar segment having been passed through the drawing die (12), the distance between the two chain assemblies being adjustable by means of a rotatable adjustment means (59a, 59b) in order to reciprocatingly vary the distance between the gripper blocks (45) defining the drawing path, the drawing assembly further comprising means (16) for driving the chains (13,113) in continuous rotation, the direction of rotation of the one chain being opposite to the direction of rotation of the other chain, the machine further comprising

grippers (17) downstream of the drawing die (12), means for momentarily actuating the grippers (17) in order to clamp an initial bar segment with reduced cross section protruding through the drawing die (12), and a first jack actuating means (22) for carrying out a relative movement between the grippers (17) and the drawing die (12), characterised in that the machine comprises a toroidal load cell (33) which is disposed in such manner as to be capable of measuring the drawing force exerted during drawing by ther bar on the drawing die (12), the load cell (33) for this purpose cooperating with the support (47) of the drawing die (12), the load cell (33) being associated with a control unit (57) for controlling actuating means (32) driving the adjustment means (59a,59b) in such manner as to control the clamping pressure exerted by the gripper blocks (45) of the chains (13, 113) on the opposite sides of the bar in dependency of the measured drawing force, and in that the grippers (17) are included in the drawing die assembly, the drawing die (12) being mounted on a carriage (18) which by means of the first jack actuating means (22) is movable along the drawing axis between a position in which the drawing die (12) is near the grippers (17) and a position in which the drawing die (12) is distant therefrom.

2. Drawing machine as in Claim 1, in which the assembly for the reciprocal adjustment of chain assemblies (13-113) includes the chain supporting plate (27-127) of each chain assembly (13-113) which has, in a substantially symmetrical intermediate position between upstream and downstream transmission sprocket wheels (16), two seats (58), each of which is associated with an eccentric pivot (28-128) of its own actuation shaft (29), the two eccentric pivots (28-128) defining respective downstream (59a) and upstream (59b) adjustment means as considered in relation to the direction of drawing (60), each actuation shaft (29) being solidly connected to a cylindrical toothed wheel (30-130), the cylindrical toothed wheels (30a-130a) of the downstream adjustment means (59a) and the cylindrical toothed wheels (30b-130b) of the upstream adjustment means (59b) respectively being coupled.

3. Drawing machine as in Claim 2, in which the coupling between the two pairs of cylindrical toothed wheels (30-130) respectively associated with the downstream (59a) and upstream (59b) adjustment means includes an intermediate gearwheel (31) for coordination of angular motion.

4. Drawing machine as in Claim 2 or 3, in which at least one eccentric pivot (28-128) of at least one of the downstream adjustment means (59a) is associated solidly with a lever (53) cooperating with an adjustable stop (35).

5. Drawing machine as in any claim hereinbefore, in which the assembly of links comprises a plurality of rolls (38) including roll containing frames (36) associated with cages (25) linked together in succession in an endless ring.

6. Drawing machine as in Claim 5, in which the roll containing frame (36) has a substantially H-shaped cross-section, with the "H" lying on one of its sides.

7. Drawing machine as in Claim 5 or 6, in which the roll containing frame (36) includes seats with a substantially cylindrical conformation arranged at a right angle to the lengthwise axis (37) of the linked cage (25), each frame (36) containing two cylindrical seats.

8. Drawing machine as in any claim hereinbefore, in which the links (44) of the chains (13-113) include small lateral containing and guide plates (52), the links (44) being conformed with a male element (54) at one end and a coordinated female seat (55) at the other end, the connecting pivots (56) being in a substantially symmetrical intermediate position.

9. Drawing machine as in any claim hereinbefore, in which the links (44) have, in a longitudinally intermediate geometric position coordinated with the position of the connecting pivots (56), a seating (48) to lodge a gripper block (45) that performs clamping and drawing of the bar (14).

10. Drawing machine as in any claim hereinbefore, in which the links (44) include means (61-62) for quick anchorage and release of the gripper blocks (45).

**Patentansprüche**

1. Maschine zum Ziehen von Stangen, mit einer ziehenden Ziehsteinanordnung und einer zugeordneten Ziehanordnung (11), die zwei endlose Ketten (13, 113) umfasst, die an einer oberen (27) bzw. einer unteren Trägerplatte (127) befestigt sind und auf einer jeweiligen Seite eines Ziehpfads angeordnet sind, wobei jede Kette eine Reihe von Gliedern (44) aufweist, die mit Greiferblöcken (45) versehen sind, um die gezogene Stange durch Einwirken auf die zwei entgegengesetzten Seiten des Stangensegments, das durch den ziehenden Ziehstein (12) hindurchgeführt wurde, festzuklemmen, wobei der Abstand zwischen den zwei Kettenanordnungen mittels einer drehbaren Einstelleinrichtung (59a, 59b) einstellbar ist, um den Abstand zwischen den den Ziehpfad festlegenden Greifblöcken (45) in hin- und hergehender Weise zu variieren, wobei die

Ziehanordnung ferner eine Einrichtung (16) zum Antreiben der Ketten (13, 113) mit kontinuierlicher Drehung aufweist, wobei die Drehrichtung der einen Kette entgegengesetzt zur Drehrichtung der anderen Kette ist, wobei die Maschine ferner Greifer (17) stromabwärts bezüglich des ziehenden Ziehsteins (12), eine Einrichtung zum momentanen Betätigen der Greifer (17) zum Festklemmen eines anfänglichen Stangensegments mit verringertem Querschnitt, das durch den ziehenden Ziehstein (12) hindurchdringt, und eine erste ausfahrende Betätigungsrichtung (22) zum Ausführen einer Relativbewegung zwischen den Greifern (17) und dem ziehenden Ziehstein (12) aufweist, **dadurch gekennzeichnet,** dass die Maschine eine toroidförmige Belastungszelle (33) aufweist, die auf solche Weise angeordnet ist, dass sie die während eines Ziehvorgangs durch die Stange auf den ziehenden Ziehstein (12) ausgeübte Ziehkraft messen kann, wobei die Belastungszelle (33) zu diesem Zweck mit dem Träger (47) des ziehenden Ziehsteins (12) zusammenwirkt und ihr eine Steuerungseinheit (57) zugeordnet ist, um eine die Einstelleinrichtung (59a, 59b) antreibende Betätigungseinrichtung (32) auf solche Weise zu steuern, dass der durch die Greiferblöcke (45) der Ketten (13, 113) auf die entgegengesetzten Seiten der Stange ausgeübte Klemmdruck abhängig von der gemessenen Ziehkraft eingestellt wird; und dass die Greifer (17) in der Anordnung des ziehenden Ziehsteins enthalten sind, wobei der ziehende Ziehstein (12) auf einem Wagen (18) montiert ist, der mittels der ersten ausfahrenden Betätigungseinrichtung (22) entlang der Ziehachse zwischen der Position, in der der ziehende Ziehstein (12) nahe an den Greifern (17) liegt, und einer Position, in der der ziehende Ziehstein (12) von diesen beabstandet ist, verstellbar ist.

**2.** Ziehmaschine nach Anspruch 1, bei der die Anordnung für die hin- und hergehende Einstellung der Kettenanordnungen (13-113) die Kettenträgerplatte (27-127) jeder Kettenanordnung (13-113) aufweist, und sie an einer im wesentlichen symmetrischen Zwischenposition zwischen einem stromaufwärtigen und einem stromabwärtigen Übertragungs-Kettenrad (16) zwei Sitze (58) aufweist, denen jeweils ein exzentrisches Schwenklager (28-128) der eigenen Betätigungsachse (29) zugeordnet ist, wobei die zwei exzentrischen Schwenklager (28-128) eine jeweilige stromabwärtige (59a) und eine stromaufwärtige (59b) Einstelleinrichtung, bezogen auf die Ziehrichtung (60), bilden, wobei jede Betätigungsachse (29) fest mit einem zylindrischen Zahnrad (30-130) verbunden ist, wobei die zylindrischen Zahnräder (30a-130a) der stromabwärtigen Einstelleinrichtung (59a) sowie die zylindrischen Zahnräder (30b-130b) der stromaufwärtigen Einstelleinrichtung (59b) jeweils verbunden sind.

**3.** Ziehmaschine nach Anspruch 2, bei der die Kopplung zwischen den zwei Paaren zylindrischer Zahnräder (30-130), wie der stromabwärtigen (59a) bzw. der stromaufwärtigen (59b) Einstelleinrichtung zugeordnet, ein Zwischen-Getrieberad (31) zum Koordinieren der Winkelbewegung aufweist.

**4.** Ziehmaschine nach Anspruch 2 oder 3, bei der mindestens ein exzentrisches Schwenklager (28-128) zumindest einer der stromabwärtigen Einstelleinrichtungen (59a) fest einem Hebel (53) zugeordnet ist, der mit einem einstellbaren Anschlag (35) zusammenwirkt.

**5.** Ziehmaschine nach einem der vorstehenden Ansprüche, bei der die Anordnung von Gliedern mehrere Rollen (38) mit Rollen enthaltenden Rahmen (36) aufweist, denen Käfige (35) zugeordnet sind, die aufeinanderfolgend zu einem endlosen Ring verbunden sind.

**6.** Ziehmaschine nach Anspruch 5, bei der der die Rollen enthaltende Rahmen (36) im wesentlichen H-förmigen Querschnitt aufweist, wobei dieses "H" auf einer seiner Seiten liegt.

**7.** Ziehmaschine nach Anspruch 5 oder 6, bei der die Rollen enthaltende Rahmen (36) Sitze mit im wesentlichen zylindrischer Form aufweist, die rechtwinklig zur Längsachse (36) der verbundenen Käfige (25) angeordnet sind, wobei jeder Rahmen (36) zwei zylindrische Sitze enthält.

**8.** Ziehmaschine nach einem der vorstehenden Ansprüche, bei der die Glieder (44) der Ketten (13-113) kleine, in Querrichtung verlaufende, aufnehmende und führende Platten (52) enthalten, wobei die Glieder (44) an einem Ende mit einem eingreifenden Element (54) und am anderen Ende mit einem koordinierten aufnehmenden Sitz (55) ausgebildet sind, wobei die verbindenden Schwenklager (56) an einer im wesentlichen symmetrischen Zwischenposition liegen.

**9.** Ziehmaschine nach einem der vorstehenden Ansprüche, bei der die Glieder (44) in einer in Längsrichtung befindlichen geometrischen Zwischenposition, die mit der Position der verbindenden Schwenklager (56) koordiniert ist, einen Sitz (48) zum Aufnehmen eines Greiferblocks (54) aufweisen, der das Klemmen und Ziehen der Stange (14) ausführt.

**10.** Ziehmaschine nach einem der vorstehenden Ansprüche, bei der die Glieder (44) eine Einrichtung (61-62) zur schnellen Verankerung und zum schnellen Lösen der Greiferblöcke (45) aufweisen.

## Revendications

1. Machine pour étirer des barres, comprenant un ensemble de filière d'étirage et un ensemble d'étirage associé (11), l'ensemble d'étirage comprenant deux chaînes sans fin (13, 113) installées sur une plaque de support supérieure (27) et une plaque de support inférieure (127) respectivement et disposées de part et d'autre d'un chemin d'étirage, chaque chaîne comprenant une série de maillons (44) pourvus de blocs de pinçage (45) pour pincer la barre étirée en agissant sur les deux côtés opposés du segment de barre qui a été passé à travers la filière d'étirage (12), la distance entre les deux ensembles de chaînes pouvant être réglée à l'aide de moyens de réglage rotatif (59a, 59b) afin de modifier de manière réciproque la distance entre les blocs de pinçage (45) définissant le chemin d'étirage, l'ensemble d'étirage comprenant, en outre, des moyens (16) pour entraîner les chaînes (13, 113) en rotation continue, le sens de rotation de la première chaîne étant opposé au sens de rotation de l'autre chaîne, la machine comprenant, en outre, des pinces (17) en aval de la filière d'étirage (12), des moyens pour actionner momentanément les pinces (17) afin de pincer un segment de barre initial de section transversale réduite qui traverse la filière d'étirage (12), et un premier moyen d'actionnement à vérin (22) pour effectuer un déplacement relatif entre les pinces (17) et la filière d'étirage (12), caractérisée en ce que la machine comprend une capsule dynamométrique torique (33) qui est disposée d'une manière telle qu'elle soit capable de mesurer la force d'étirage exercée pendant l'étirage par la barre sur la filière d'étirage (12), la capsule dynamométrique (33) coopérant à cet effet avec le support (47) de la filière d'étirage (12), la capsule dynamométrique (33) étant associée à une unité de commande (57) destinée à commander des moyens d'actionnement (32) entraînant des moyens de réglage (59a, 59b) d'une manière propre à régler la pression de serrage exercée par les blocs de pinçage (45) sur les chaînes (13, 113) sur les côtés opposés de la barre en fonction de la force d'étirage mesurée et en ce que les pinces (17) sont incluses dans l'ensemble de filière d'étirage, la filière d'étirage (12) étant montée sur un chariot (18) qui, à l'intervention du premier moyen d'actionnement à vérin (22) peut être déplacé le long de l'axe d'étirage entre une position dans laquelle la filière d'étirage (12) est proche des pinces (17) et une position dans laquelle la filière (12) est distante de ces pinces.

2. Machine à étirer suivant la revendication 1, dans laquelle l'ensemble pour le réglage réciproque des ensembles de chaînes (13-113) comprend la plaque de support de chaîne (27-127) de chaque ensemble de chaîne (13-113) qui présente, dans une position intermédiaire sensiblement symétrique entre les roues à chaîne de transmission amont et aval (16), deux sièges (58) qui sont chacun associés à un pivot excentrique (28-128) de son propre arbre d'actionnement (29), les deux pivots excentriques (28-128) définissant des moyens de réglage d'aval (59a) et d'amont (59b) respectifs, vu par rapport à la direction d'étirage (60), chaque arbre d'actionnement (29) étant relié rigidement à une roue dentée cylindrique (30-130), les roues dentées cylindriques (30a-130a) du moyen de réglage d'aval (59a) et les roues dentées cylindriques (30b-130b) du moyen de réglage d'amont (59b) étant respectivement accouplées.

3. Machine à étirer suivant la revendication 2, dans laquelle l'accouplement entre les deux paires de roues dentées cylindriques (30-130) respectivement associées aux moyens de réglages d'aval (59a) et d'amont (59b) comprend une roue dentée intermédiaire (31) pour la coordination du mouvement angulaire.

4. Machine à étirer suivant la revendication 2 ou 3, dans laquelle au moins un pivot excentrique (28-128) d'au moins un des moyens de réglage d'aval (59a) est associé rigidement à un levier (53) coopérant avec une butée réglable (35).

5. Machine à étirer suivant l'une quelconque des revendications précédentes, dans laquelle l'ensemble de liaisons comprend une pluralité de rouleaux (38) comprenant des cadres de confinement de rouleaux (36) associés à des cages (25) reliées les unes aux autres en succession en une boucle sans fin.

6. Machine à étirer suivant la revendication 5, dans laquelle le cadre de confinement de rouleaux (36) a une section transversale en substance en forme de "H", le "H" étant disposé sur un de ces côtés.

7. Machine à étirer suivant la revendication 5 ou 6, dans laquelle le cadre de confinement de rouleaux (36) comprend des sièges de configuration sensiblement cylindrique disposés perpendiculairement à l'axe longitudinal (37) de la cage (25), chaque cadre (36) contenant deux sièges cylindriques.

8. Machine à étirer suivant l'une quelconque des revendications précédentes, dans laquelle les maillons (44) des chaînes (13-113) comprennent de petites plaques latérales de confinement et de guidage (52), les maillons (44) étant pourvus d'un élément mâle (54) à une extrémité et d'un siège femelle coordonné (55) à l'autre extrémité, les pivots de liaison (56) se trouvant dans une position

intermédiaire sensiblement symétrique.

**9.** Machine à étirer suivant l'une quelconque des revendications précédentes, dans laquelle les maillons (44) ont, dans une position géométrique intermédiaire dans le sens longitudinal, coordonnée avec la position des pivots de liaison (56), un siège (48) destiné à loger un bloc de pinçage (45) qui assure le pinçage et l'étirage de la barre (14).

**10.** Machine à étirer suivant l'une quelconque des revendications précédentes, dans laquelle les maillons (44) comprennent des moyens (61-62) pour permettre un ancrage et une libération rapides des blocs de pinçage (45).

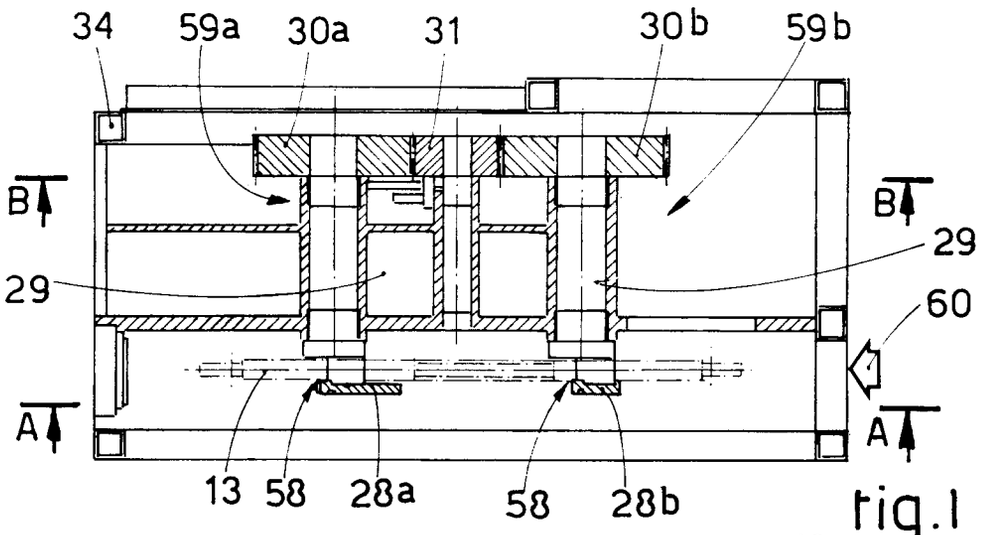



fig.1

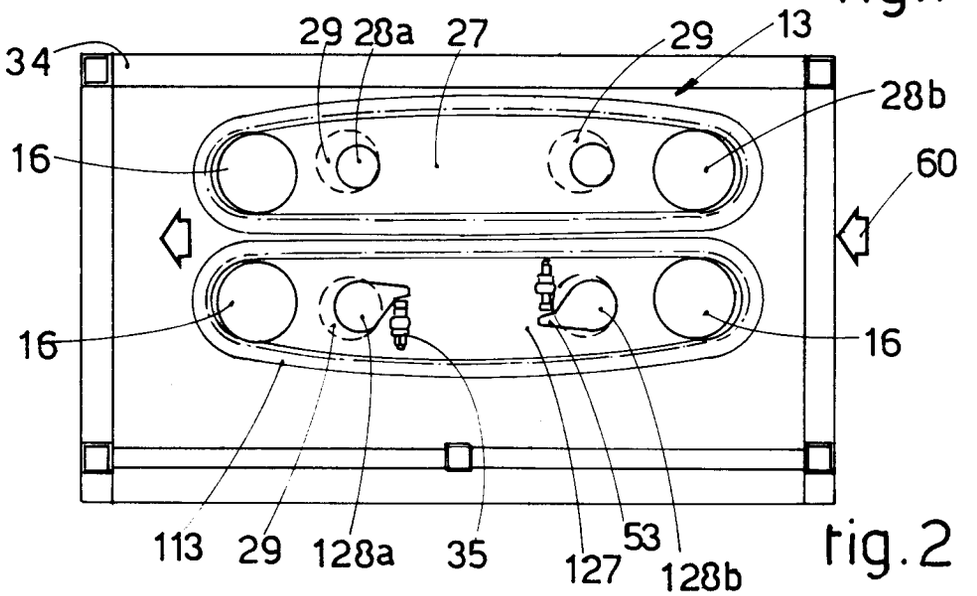



fig.2

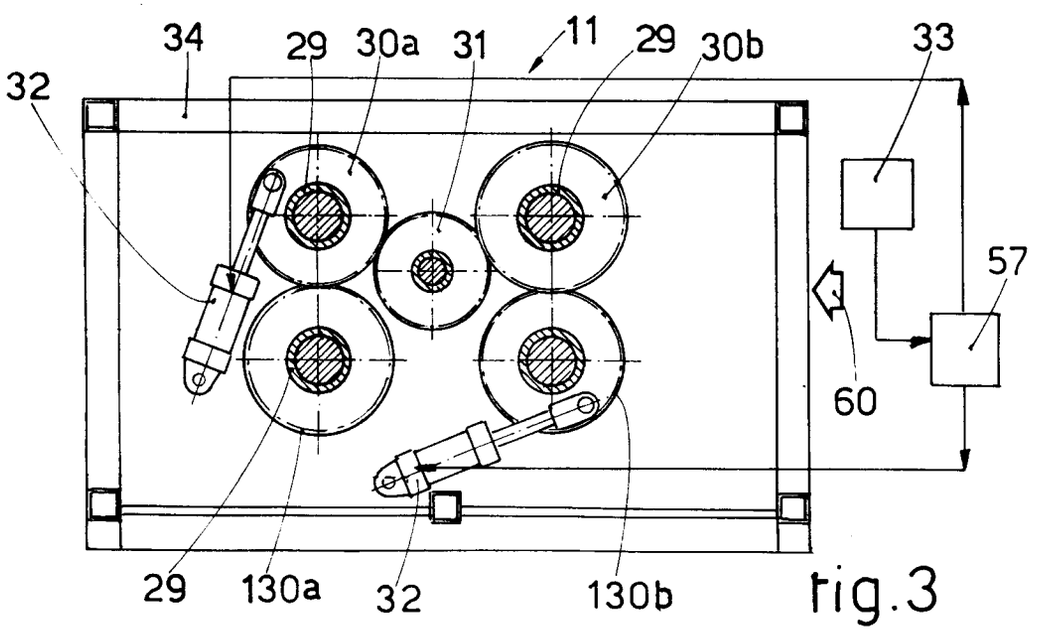



fig.3

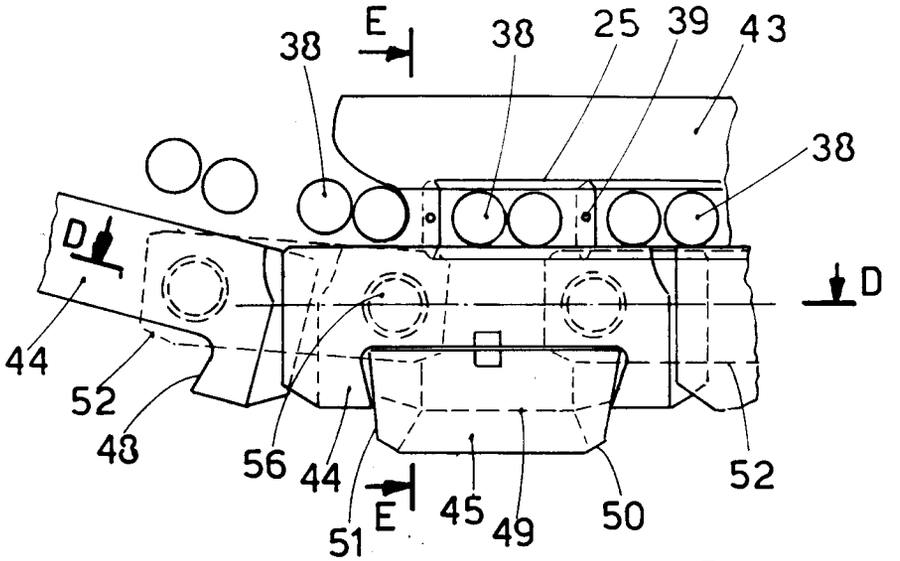



fig.4

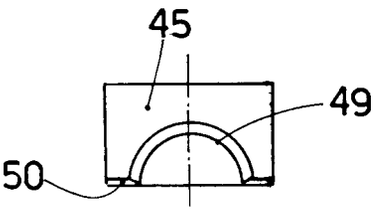



fig.5

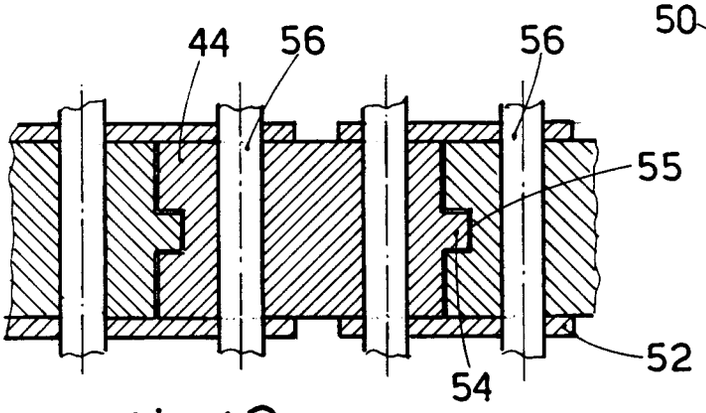



fig.12

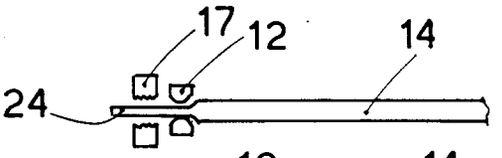



fig.9a

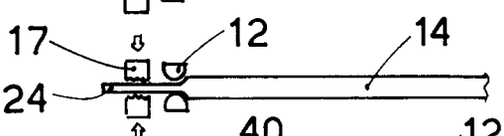



fig.9b

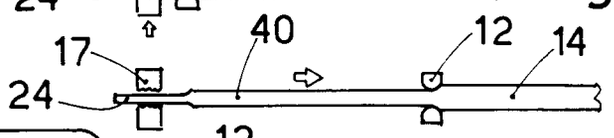



fig.9c




fig.9d

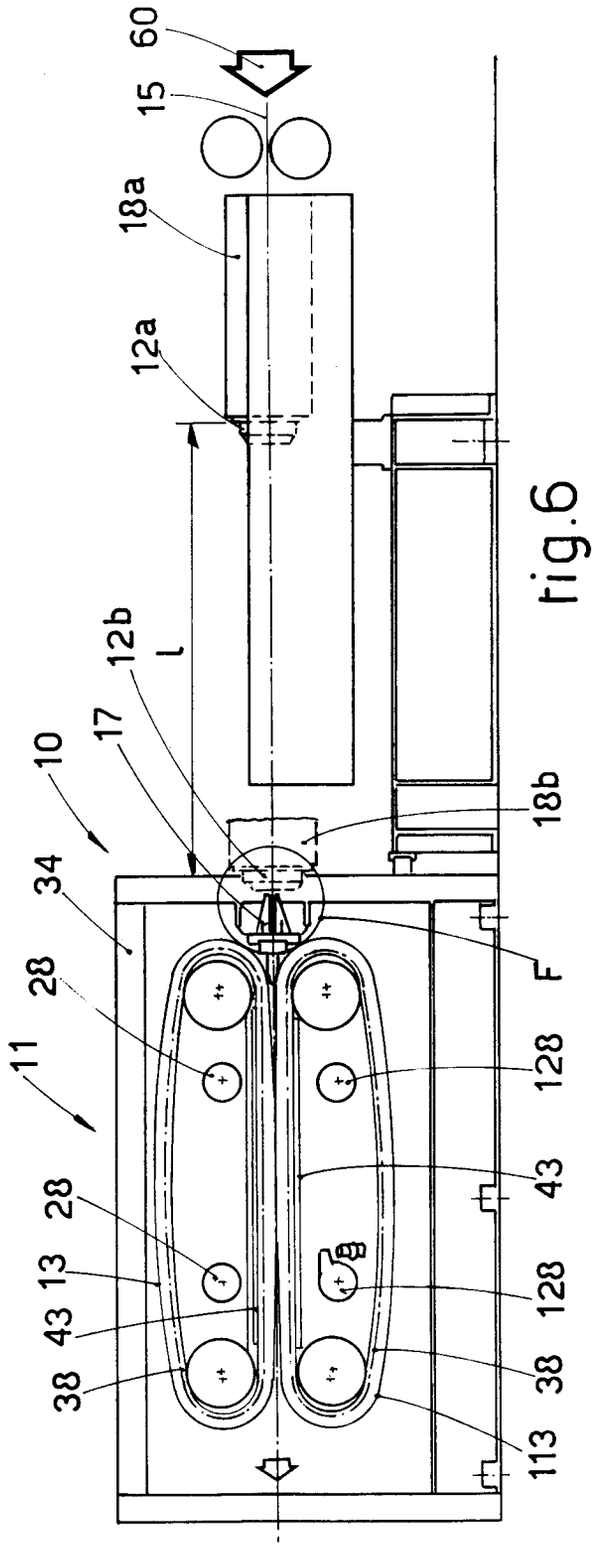

60
15
18a
12a
L
12b
17
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34
28
11
28
13
43
38
18b
F
128
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113

fig.6

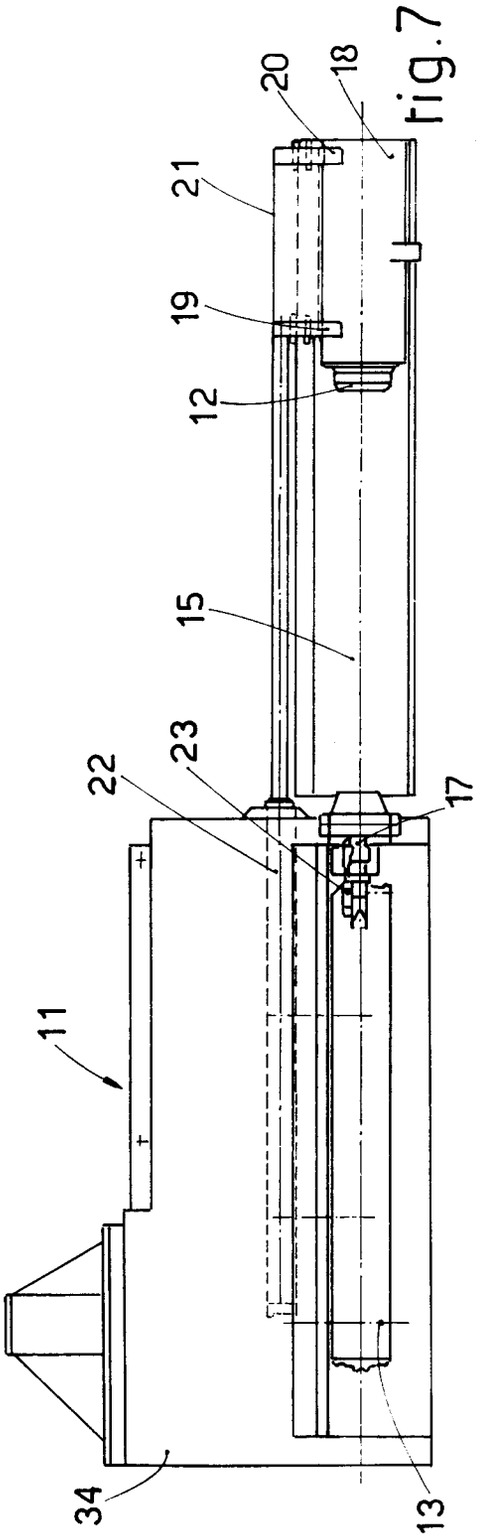

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fig.7

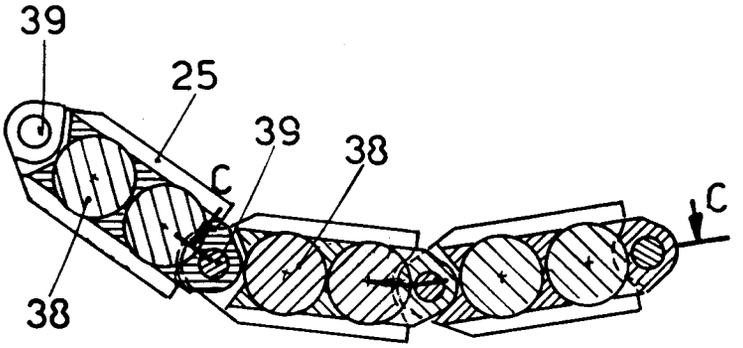



fig.10

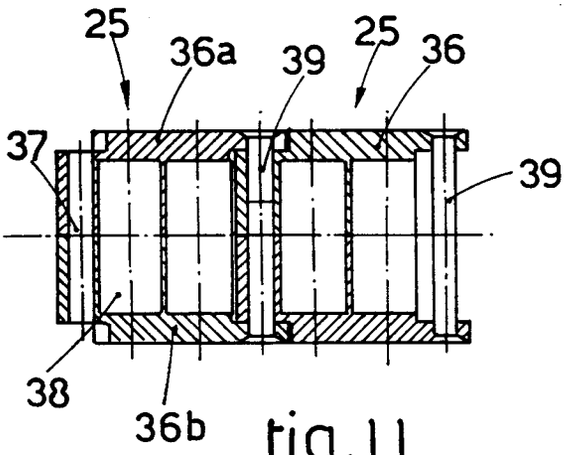



fig.11

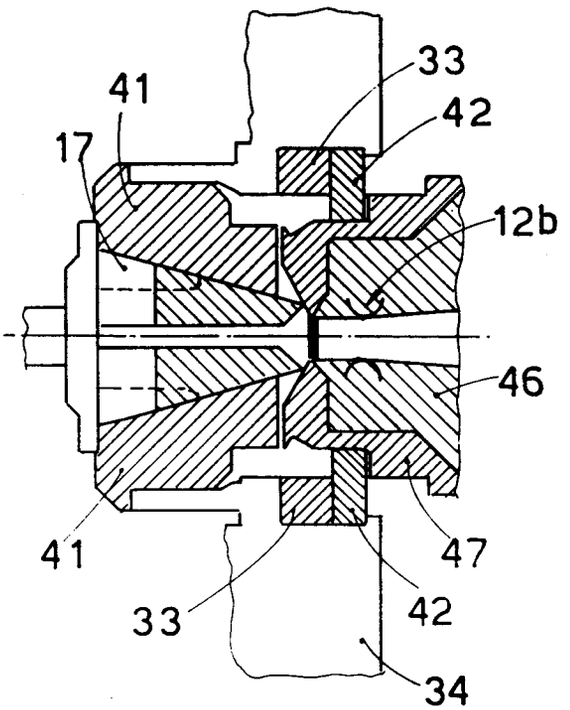



fig.8

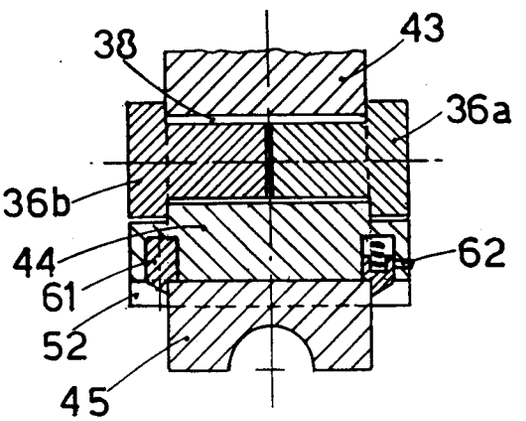



fig.13