

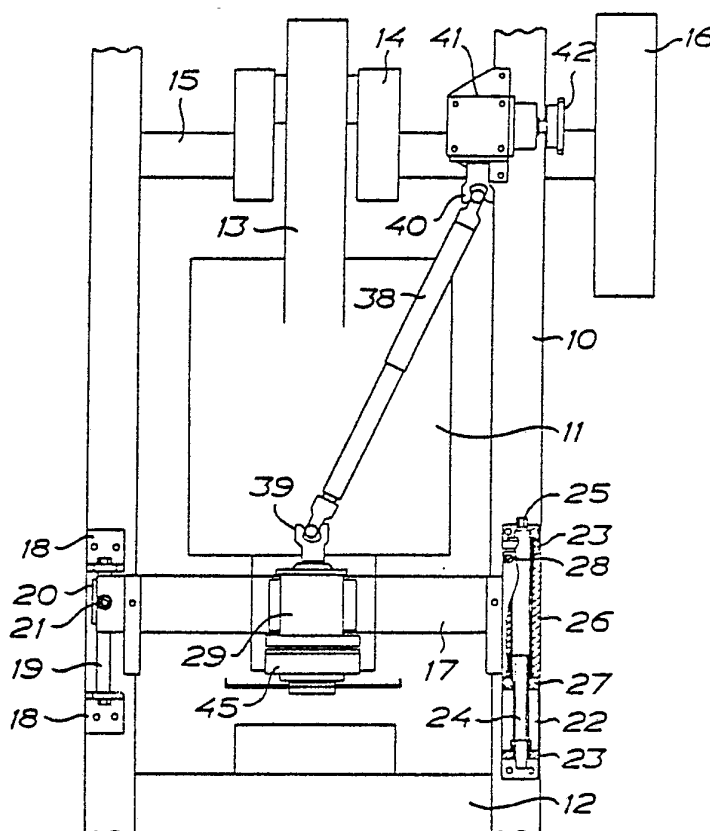


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(21) International Application Number: PCT/SE81/00079 (22) International Filing Date: 13 March 1981 (13.03.81) (71) Applicant (for all designated States except US): VENTIVE AB [SE/SE]; Näsbydalsvägen 23, S-183 31 Täby (SE). (72) Inventors; and (75) Inventors/Applicants (for US only): WALLENIOUS, Jan, Folke [SE/SE]; Näsby Allé 59, S-183 30 Täby (SE). HELGESSON, Carl, Olov [SE/SE]; Ankammsgatan 21, S-171 43 Solna (SE). (74) Agents: STRÖM, Tore et al.; Ström & Gulliksson AB, Rundelsgatan 14, S-211 36 Malmö (SE).		(81) Designated States: AT (European patent), AU, CH (European patent), DE (European patent), DK, FI, FR (European patent), GB (European patent), JP, LU (European patent), NL (European patent), SE (European patent). Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i>

(54) Title: AN ARRANGEMENT IN AN ECCENTRIC PRESS**(57) Abstract**

An arrangement in an eccentric press with a reciprocating press element (17) driven from a rotary drive shaft (15). A picking arm with a holder (60) for workpieces is drivably connected to the drive shaft (15) via a transmission (38-44), said picking arm being linearly displaceable in the horizontal direction by the rotation of the drive shaft between a position (P1) in the eccentric press and a position (P2) outside the eccentric press.



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AN ARRANGEMENT IN AN ECCENTRIC PRESS

The invention relates to an arrangement in an eccentric press with a reciprocating press element
5 driven from a rotating drive shaft.

The supply of work pieces to an eccentric press for working between the press elements thereof is usually automated and then takes place with the aid of various types of feeder troughs. Removal of the worked
10 workpieces however generally takes place manually which not only involves a risk for the person operating the eccentric press but also causes a considerable reduction of the production rate.

The object of the present invention is to provide
15 automatic, mechanically controlled removal of the workpieces from an eccentric press in co-ordination with the working cycle thereof in a reliable and safe manner and whilst permitting a high production rate of the eccentric press.

20 To achieve this object the arrangement in accordance with the invention has obtained the characteristics of claim 1.

In order to explain the invention in greater detail reference is made to the accompanying drawings in
25 which

FIG. 1 is a front view of an eccentric press with the arrangement in accordance with the invention, FIG. 2 is a plan view, partly in horizontal cross section, of a supporting beam for a picking arm
30 which forms part of the arrangement in accordance with the invention,

FIG. 3 is a side view of the eccentric press with the arrangement in accordance with the invention, FIG. 4 is a plan view of the arrangement in accordance with the invention and the supporting
35



beam thereof the eccentric press pedestal being partially shown in horizontal cross section, FIG. 5 is an enlarged side view, partly a vertical cross sectional view, of the picking arm, FIG. 6 is a plan view of the picking arm in FIG. 5,

FIG. 7 A - E are diagrammatic plan views of the picking arm in accordance with the invention which show various phases of the working cycle thereof, FIG. 8 is a side view of the holder end of the picking arm in accordance with the invention in a modified embodiment, FIG. 9 is a partial plan view of the arrangement in FIG. 8,

FIG. 10 is a diagrammatic side view of the arrangement in accordance with the invention showing means for control of the removal, and FIG. 11 is a diagrammatic plan view of the arrangement in FIG. 10.

In FIG. 1 - 4, to which reference will be made first, a commercial design of eccentric press is illustrated comprising a conventional column pedestal 10 in which an upper press element 11 is arranged which can move upwards and downwards for interaction with a lower press element 12 which is fixedly mounted to the pedestal. It is assumed that pressing tools (die and pad) are mounted to the press elements in a known manner for working the workpieces supplied to the desired shape by stamping and/or pressing; the tools may be either substance tools in which the worked workpiece accompanies the tool of the upper press element during the return stroke, or table tools, in which the worked workpiece remains stationary in the tool of the lower press element during the return stroke. The upper press element which moves up and down

is arranged as a runner which is guided in the pedestal for vertical displacement in a manner not shown in detail here, and is connected by means of a connecting rod 13 to a crank or eccentric 14 on a substantially horizontal drive shaft 15 which is rotated from a drive motor at a drive wheel (fly wheel) mounted to the shaft. The drive shaft 15 is always rotated in the same direction either continuously or intermittently (single-acting) in accordance with well known principles.

The arrangement in accordance with the invention is mounted on the eccentric press described, and an important element in this arrangement is a picking arm, the task of which is to remove the workpieces worked in the eccentric press, as these become ready and to deposit them outside the eccentric press. To support the picking arm the eccentric press is supplemented by a supporting beam 17. Two mounting angles 18 are fastened to the pedestal 10, one located above the other, for the mounting of the supporting beam, a cylindrical shaft 19 being gripped between the mounting angles, on which a sleeve 20 is slidably arranged. The sleeve has a threaded bolt 21 projecting radially therefrom and provided with a nut, and one end of the supporting beam 17 is clamped to the sleeve by means of this bolt and nut, as shown most clearly in FIG. 2.

To support the supporting beam 17 at the other end thereof a plate 22 is fastened to the pedestal 10, having two bearing flanges 23, one above the other, a screw spindle 24 being mounted in these bearing flanges so as to be rotatable but non-displaceable axially. For this purpose the bearing flanges are provided with suitable bearing bushes. At its upper end the screw spindle has a hexagonal spigot 25 so that it can be rotated at this spigot by means of a suitable



tool, e.g. a socket wrench or adjustable spanner. A cylindrical sleeve 26 is passed with sliding fit onto the screw spindle and has at its lower end a trapezoidally threaded nut 27 fastened thereto, which
5 engages a trapezoidally threaded portion of the screw spindle. The supporting beam 17 is fixedly connected to the sleeve 26 and as will easily be understood the supporting beam can be displaced vertically by rotating the screw spindle 24, the sleeve being screwed axially
10 upwards or downwards dependent on the direction of rotation of the screw spindle, and the sleeve 20 simultaneously sliding along the shaft 19.

To lock the sleeve 26 in the set position so that the adjustment is not changed as a result of shaking or
15 vibration in the pedestal 10 when the eccentric press is in operation, the upper portion of the sleeve is designed as a clamp in that, in a manner not shown in detail, it is separated from the remainder of the sleeve by means of a horizontal slot which extends
20 over only a part of the circumference of the sleeve, and furthermore is slotted axially on one side so that the said upper portion of the sleeve can be clamped around the screw spindle by tightening a screw connection 28.

25 Apart from the fact that the supporting beam 17 can be adjusted vertically by means of the arrangement described, this also enables the beam to be swung outwards from the pedestal 10. This is possible by separating the beam from the sleeve 20 by unscrewing the
30 nut from the bolt 21, after which the beam can be pivoted on the screw spindle 24 which rotates in the bearing flanges 23 thereof.

The frame 29 of the picking arm is fixedly attached to the supporting beam 17. With reference
35 also to FIG. 5, this frame forms a cylindrical bearing



housing with a plane mounting flange 30, at which the bearing housing is mounted by means of a bolt connection to the supporting beam. In the bearing housing, a shaft 33 is rotably mounted by means of deep grooved ball bearings 31 which are kept mutually spaced by means of a spacer sleeve 32, and this shaft is provided with locking nuts 34 at the top which together with a flange 35 at the bottom prevent the shaft 33, which is inserted from underneath, from moving axially. At the top the shaft 33 projects from an end cover 36 attached to the bearing housing, and forms a connecting spigot 37 at its projecting end.

A universal joint shaft 38 consisting of an internally splined first portion and an externally splined second portion which can move axially in the first portion, is connected at the second portion to the connecting spigot 37 by means of a universal joint 39, whilst the first portion of the universal joint shaft is connected by means of a corresponding universal joint 40 to the output shaft of an angle gear train 41, the input shaft of which is provided with a chain wheel 42. This is connected by means of a roller chain 43 to a chain wheel 44 on the shaft 15. The gear ratio between shafts 15 and 33, which is governed by the gear ratio of the angle gear train 41 and the chain transmission 42, 43, 44 should be 1:1.

It would be obvious that the drive connection between shafts 15 and 33 enables the supporting beam to be unrestrictedly adjusted in height and to be swung outwards from the pedestal 10 with the picking arm attached to the supporting beam without the drive connection being broken.

The design of the picking arm will be described in greater detail by reference to FIGS. 5 and 6.

A first arm 45 includes a box-shaped lower section



46a and a cover 46b which is fastened thereto, and the lower portion thereof is mounted to the lower end of the shaft 33 by means of bolts 47 and fixed to this end by cylindrical pins 48 so that the arm 45 can be
5 swung by rotating the shaft 33. This arm forms a gear-box housing and contains a gear drive with a gear wheel 49 which is non-rotably mounted to the bearing housing 29 by means of bolts 50 and cylindrical pins 51. Thus, this gear wheel is stationary and it engages
10 a second gear wheel 52 which is rotably mounted on a fixed pin 53 in the lower section 46a by means of a deep groove ball bearing 54 installed in a conventional manner, and engages in turn a third gear wheel 55
15 rotably mounted at end pins which can be integral with the gear wheel, in the lower section 46a and the cover 46b by means of deep groove ball bearings 56 and 57, respectively.

A tool arm 58 is attached by bolts 59 to the lower end pin of the gear wheel 55 and supports a tool 60
20 which is detachably and adjustably mounted. Thus, it can be seen that the arm 45 can be pivoted relative to the bearing housing 29 (frame of the picking arm) around a vertical axis and that the arm 58 can be pivoted relative to the arm 45 similarly around a
25 vertical axis, the relative pivoting of the arms being positively controlled from the pivoting of the arm 45 by means of the gear drive arranged in the arm (gear-box housing) 45 in a manner to be described later. The gear drive is so dimensioned (gear wheels 49 and 55)
30 that the ratio between the shaft 33 and the arm 58 is 1:2, i.e. when the arm 45 is rotated through a certain angle relative to the bearing housing 29, the arm 58 will be rotated through an angle which is twice as great, relative to the arm 45.

35 With reference to FIGS. 7A - 7E, the picking arm



is shown by continuous lines in FIG. 7A in the same adjusted position as that in FIG. 5, i.e. the arms 45 and 58 are arranged along the dot and dash line 61. If now the arm 45 is rotated in clockwise direction by means of the shaft 33 from the position shown in FIG. 7A through an angle α to the position in FIG. 7B, the arm 58 will be rotated in counter clockwise direction by means of the gear wheel 59 through an angle β , which because of the transmission ratio 1:2 in the gear drive will be twice as large as the angle α .

When the arm 45 has been rotated through 90° in clockwise direction from the position shown in FIG. 7A to the position in FIG. 7C, the arm 58 has been rotated through 180° , and when the arm 45 during continued rotation thereof, an intermediate position being illustrated in FIG. 7D, has completed one half a turn the picking arm takes the position shown in FIG. 7E in which the arm 58 has been rotated 360° relative to the arm 45. As a result of this movement the tool 60 is thus displaced along a straight line from the position P1 to the position P2 along the line 61; the position P1 should be located in the eccentric press between the pressing tools supported by the press elements 11 and 12 and position P2 should be located outside the eccentric press. This is shown in greater detail in FIGS. 3 and 4 where the tool arm 58 is shown in the position P1 in the eccentric press. The tool 60 is here shown as a spade to receive the workpieces ejected from the pressing tool on the upper press element (a substance die is involved here) and to remove, during a linear movement to the position P2 outside the eccentric press, the workpieces one by one from the eccentric press as the workpieces are finished. In the position outside the eccentric press an electromagnet 62 is supported by means of a bracket 63 attached to



the pedestal 10 in order that the electromagnet, when energised, shall attract to it the workpiece on the spade in the position P2 and then when the spade has been moved away from the position P2 to be moved once again to the position P1, shall be deenergised and shall drop the workpiece. The use of microswitches for the control of the current supply to the electromagnet in dependence of the movement of the picking arm represents elementary control technique and this need not be described in greater detail here.

A projecting cover 64 is attached to the pedestal 10 to enclose the area of movement of the picking arm so that this cannot cause injury to personnel when it rotates outwards from the eccentric press. This cover can be completely open at the bottom or can have a bottom with an aperture below the electromagnet 62 to permit downward release of the workpieces from the electromagnet.

The tool 60 should of course be adapted to the workpieces which are to be handled. In some cases a spade can be appropriate, as illustrated here, but it should be provided with a rim 65 so that the workpiece does not slide off the tool but will be kept in place during acceleration and retardation of the tool.

FIGS. 8 and 9 illustrate how a tool can be arranged on the arm 58 when the eccentric press operates with table tools on the press elements. It consists of an electromagnet 60' which is energised in the position P1 so as to attract the workpiece to it and is deenergised in the position P2 so as to release the workpiece, which can be achieved by elementary control technique. Other types of tools adapted to the components can of course also be employed.

The picking arm is driven positively from the drive shaft 15 of the eccentric press and as will be



understood it must initially be adjusted as regards the position thereof relative to the position of the runner of the eccentric press so that the working cycles of the picking arm and eccentric press will be co-ordinated in the correct manner. This means that the tool 60 or 60' must be brought into the position P1 when the gap between the press tools is sufficiently large for the workpiece to be inserted therebetween. Furthermore, with substance tools, the ejection of the workpiece must be co-ordinated with the movement of the picking arm. After co-ordination has been achieved, the picking arm will operate in step with the eccentric press, positively controlled therefrom, the picking arm rotating continuously in one and the same direction as long as the drive shaft 15 rotates.

The arrangement in accordance with the invention enables removal of the workpieces to take place fully automatically at precisely the right time during the working cycle of the eccentric press without any manual intervention. This gives a calculable production flow from the eccentric press. The arrangement functions rapidly; during tests with a prototype no less than 90 cycles per minute were achieved. It also operates at low noise level and is hence environmentally suitable.

As a result of the possibility of swinging the supporting beam 17 outwards from the pedestal 10 the eccentric press can be rendered accessible for service and tool changing. To prevent the picking arm from being displaced when the supporting beam is swung out, an interlock should be provided by means of which the eccentric press cannot be started or alternatively the picking arm is disconnected from the shaft 15 as long as the supporting beam 17 is swung outwards.

It is however important to monitor the removal of the workpieces so that the press will not perform a



new working stroke with a previously worked workpiece in position between the press tools, if the picking arm should miss the removal. An example of how this monitoring system can be arranged is shown in FIGS. 10 and 11.

With reference to FIGS. 10 and 11, a stationary inductive sensor 66 is arranged above the arm 45 to be actuated by a cam 67 on the arm when this is located within a predetermined angular area. A photo sensor comprising a transmitter 68 and a receiver 69 is arranged in the path of movement of the arm 58; this can be replaced by an inductive sensor. In the spade 60 a slot 70 is provided which during the movement of the picking arm intersects the light beam between the transmitter 68 and the receiver 69. The sensor 66 and receiver 69 are connected in series and if both are activated simultaneously (the cam 67 below the sensor 66 - the light beam from the transmitter 68 arrives at the receiver 69), a signal is given to a device (for example an electrical contact) by means of which the eccentric press is stopped.

When a workpiece drops onto the spade 60 and due to accelerational forces is engaged with the rim 65, it will cover the slot 70. When the spade during its movement from P1 to P2 intersects the beam between 68 and 69 the cam 67 has come into the position to actuate the sensor 66, but since the slot is covered by the workpiece and hence the receiver 69 is not activated, the press will not be stopped. When the spade no longer intersects the light beam, the movement of the picking arm having continued, the inductive sensor 66 is no longer activated because the cam 67 has moved from the sensor and also in this case the press will not be stopped.

If, however, the light beam can reach the re-



ceiver 69 through the slot 70 when there is no workpiece on the spade the receiver 69 will be activated whilst at the same time the sensor 66 is activated and then the press will be stopped.

5 A corresponding safety arrangement for a tool in accordance with FIGS. 8 and 9 can include means for measuring the electrical output to the electromagnet 60' and for sensing the difference in output when a workpiece is attracted to the magnet and when this is not the case. The press will be stopped when power
10 output sensing indicates that there is no workpiece on the magnet when this leaves the position P1 in the eccentric press. The sensing moment can be governed by cams and sensors in the same manner as in the embodiment illustrated in FIGS. 10 and 11. During the
15 sensing of the electromagnet power output, the sensor must be calibrated continuously so as to compensate for temperatur variations in the magnet.



CLAIMS

1. An arrangement in an eccentric press with a reciprocating press element (11) driven from a rotary drive shaft (15), c h a r a c t e r i z e d in that
5 a substantially vertical first shaft (33) which is rotably mounted on the pedestal (10) of the eccentric press is drivably connected via a transmission (38 - 44) to the drive shaft (15), supporting a first arm (45) at one end thereof, whilst a second arm (58) with
10 a holder (60) for the workpiece is arranged at the other end of the first arm for pivotal movement around a second shaft parallel with the first shaft, a second transmission (49, 52, 55) being arranged between the pedestal (10) of the eccentric press and the second
15 arm (58) and having a ratio of 1:2 to provide a linear displacement of the holder (60) in the horizontal direction between a position (P1) in the eccentric press and a position (P2) outside the eccentric press as a result of the pivotal movement of the arms during
20 rotation of the drive shaft.

2. An arrangement as claimed in claim 1, c h a r a c t e r i z e d in that the vertical first shaft (33) is mounted on a member (17) adjustable on the pedestal of the eccentric press as to the position
25 thereof and is connected to the drive shaft (15) by means of a universal shaft (38 - 40) which permits adjustment of said member on the pedestal (10).

3. An arrangement as claimed in claim 2, c h a r a c t e r i z e d in that said member (17) comprises
30 a supporting beam which can be adjusted vertically to different positions on the pedestal and can be swung out from the pedestal.

4. An arrangement as claimed in any of claims 1 - 3, c h a r a c t e r i z e d in that said one
35 arm (45) is arranged as a gearbox housing for a gear



drive (49, 52, 55) forming said second transmission.

5 5. An arrangement as claimed in claim 4, c h a r -
a c t e r i z e d in that the gear drive includes a
gear wheel (49) fixedly connected to the pedestal (10),
and a gear wheel (55) connected to said second arm,
as well as an intermediate gear wheel mounted in said
first arm (45) and engaging the two first-mentioned
gear wheels.

10 6. An arrangement as claimed in any of claims
1 - 5, c h a r a c t e r i z e d by a device (62) in
the position (P2) outside the eccentric press for
removing the workpiece from the holder (60).

15 7. An arrangement as claimed in claim 6, c h a r -
a c t e r i z e d in that the holder comprises a
spade (60) for carrying workpieces and that the device
for removing workpieces from the spade comprises an
electromagnet (63).

20 8. An arrangement as claimed in claim 6, c h a r -
a c t e r i z e d in that the device for carrying
workpieces comprises an electromagnet (60') on said
second arm (58).



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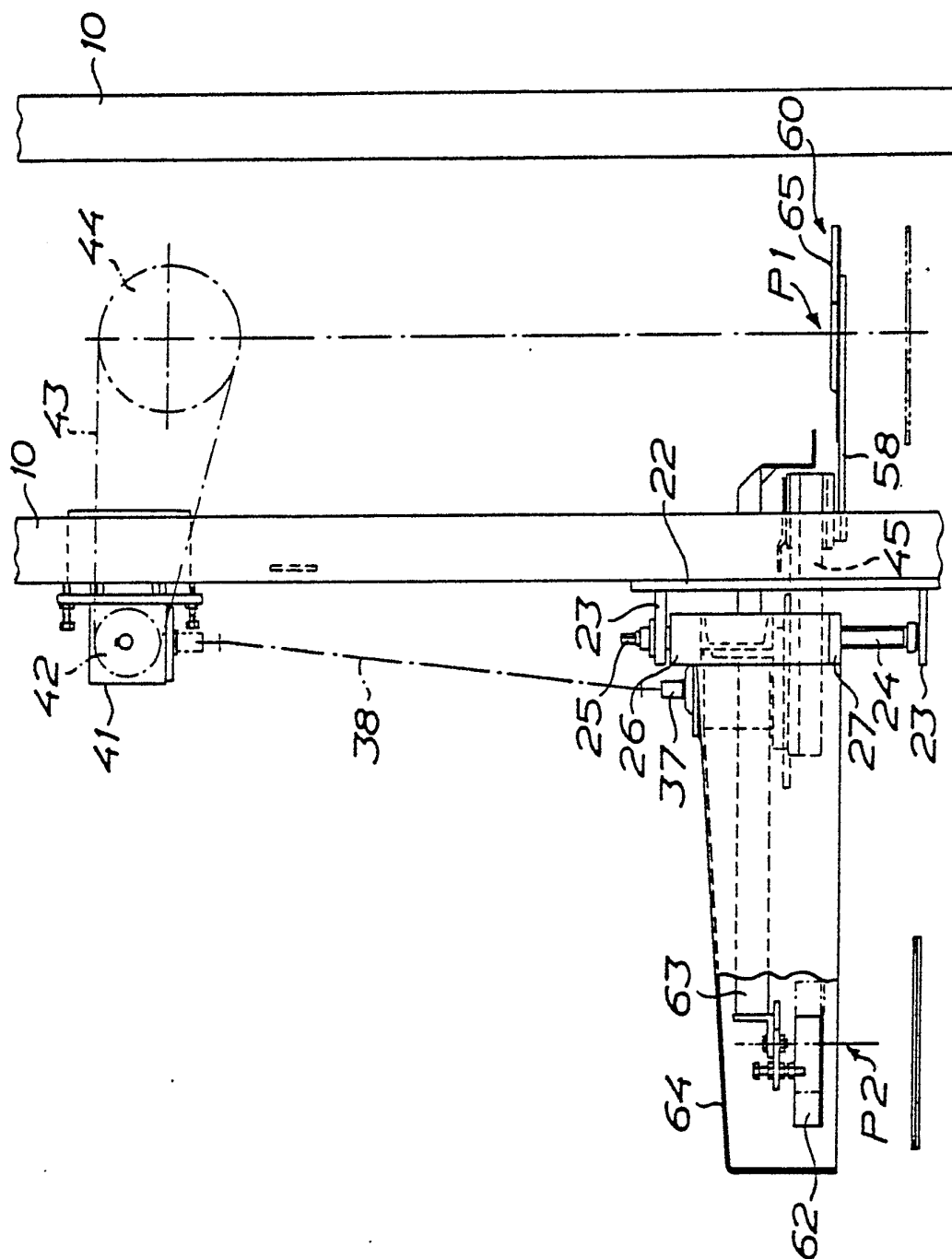


FIG. 3

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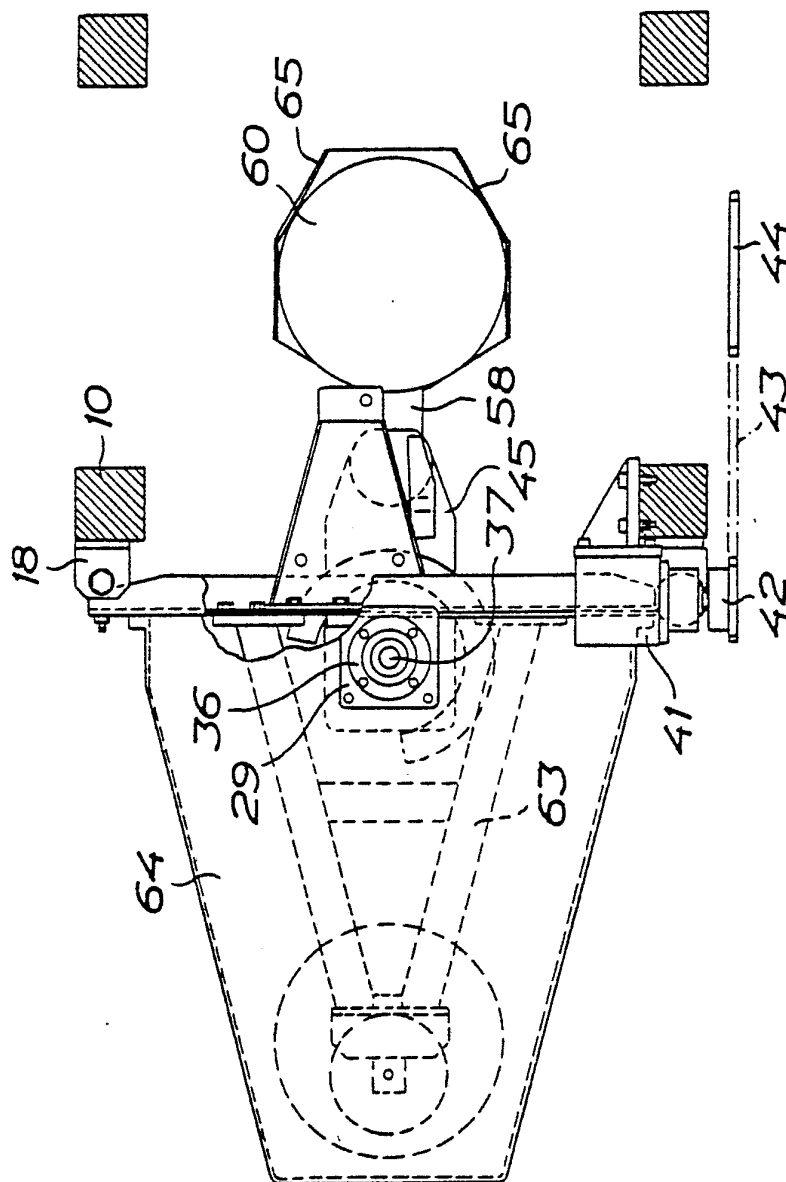


FIG. 4

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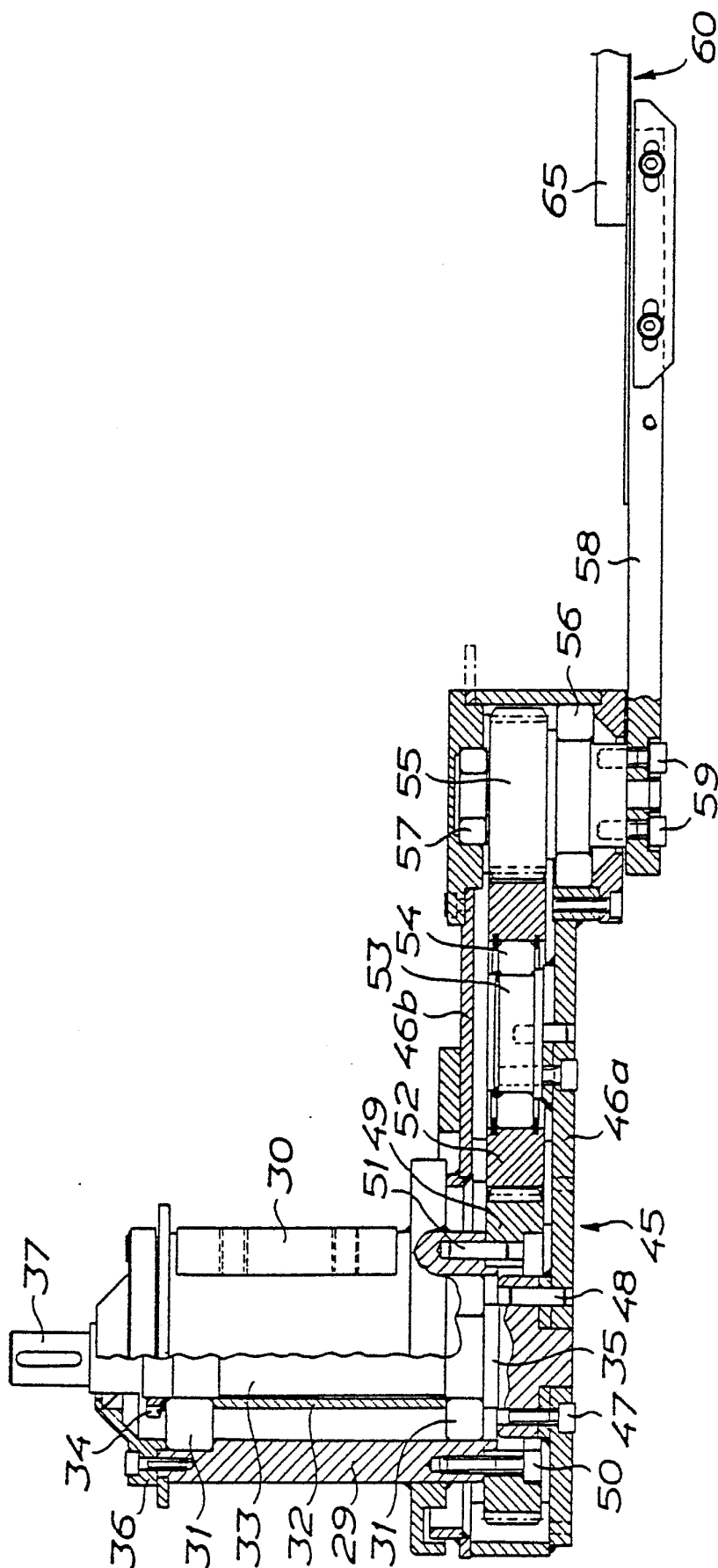


FIG. 5

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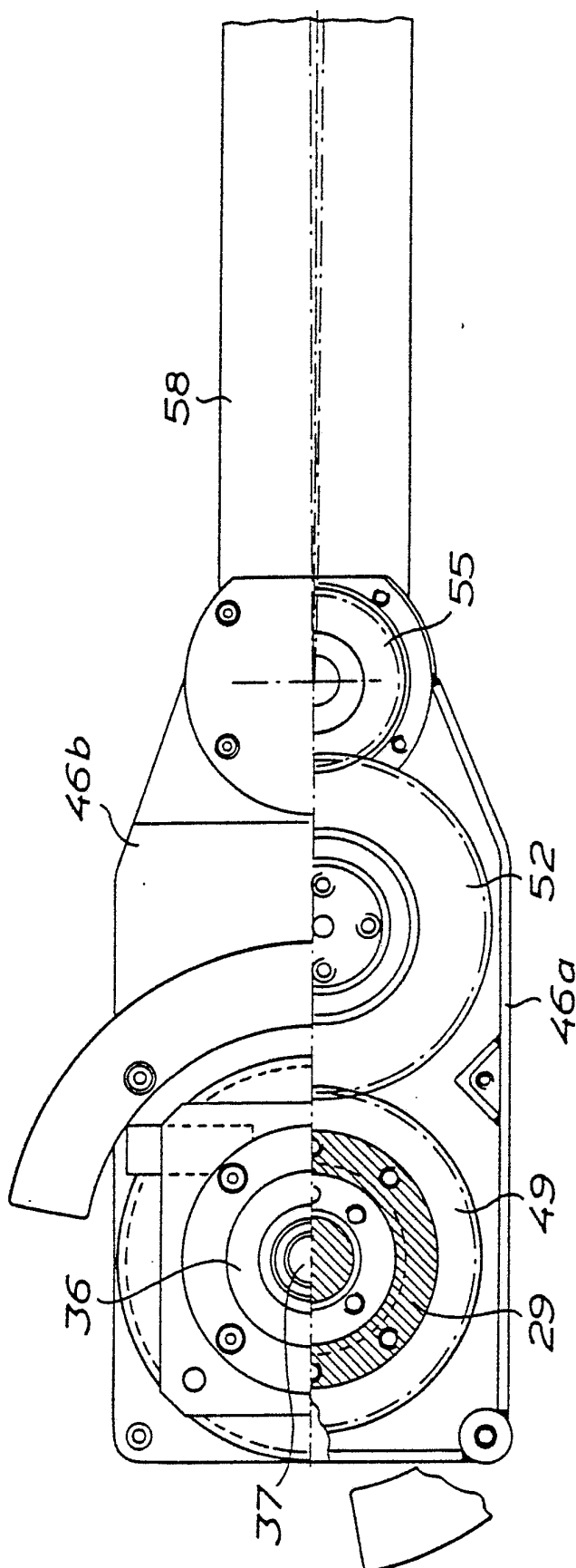


FIG. 6

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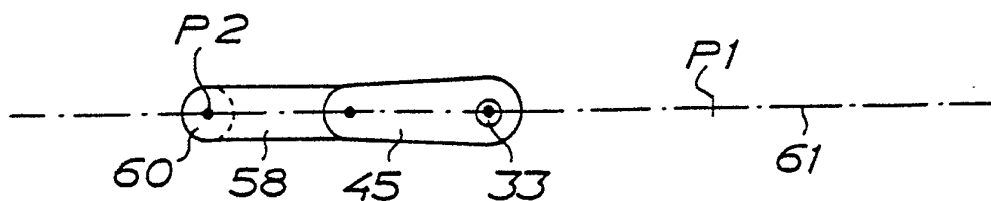


FIG. 7E

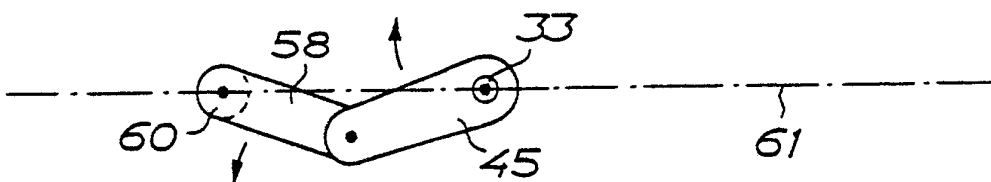


FIG. 7D

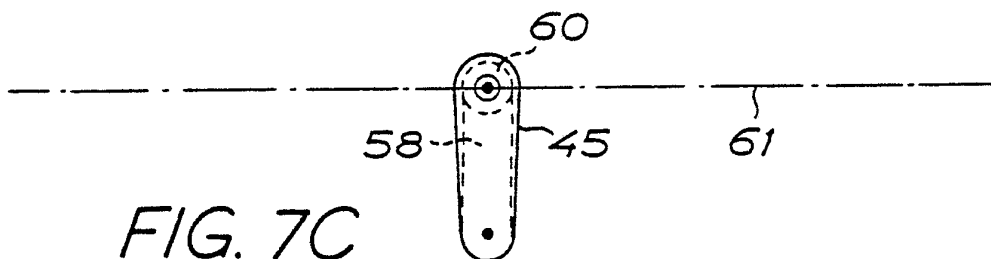


FIG. 7C

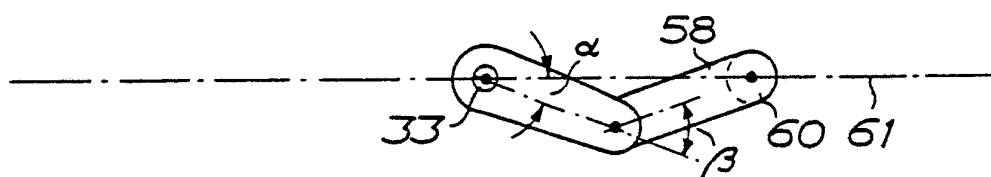


FIG. 7B

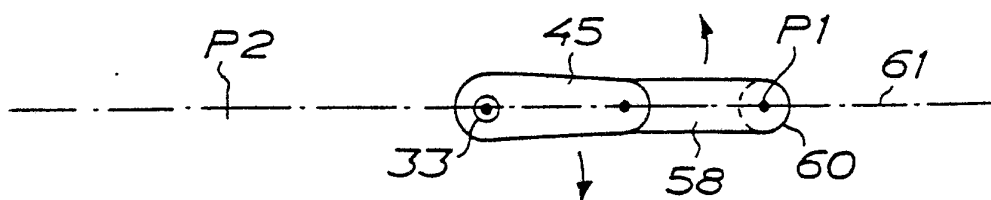


FIG. 7A

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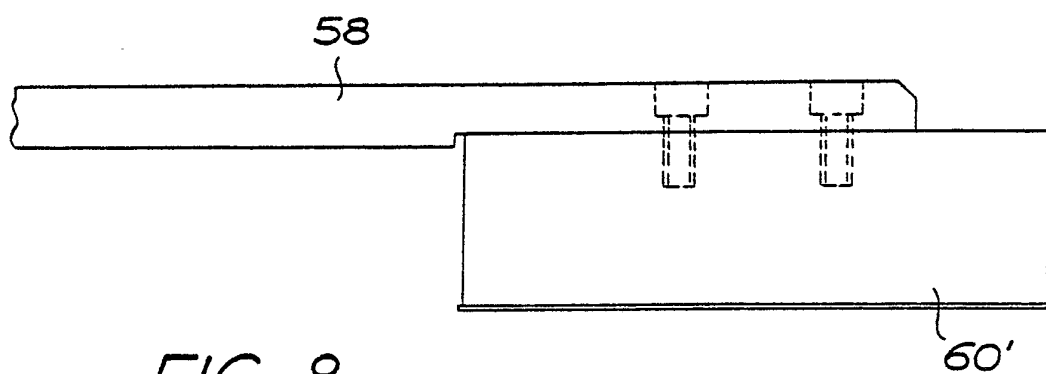


FIG. 8

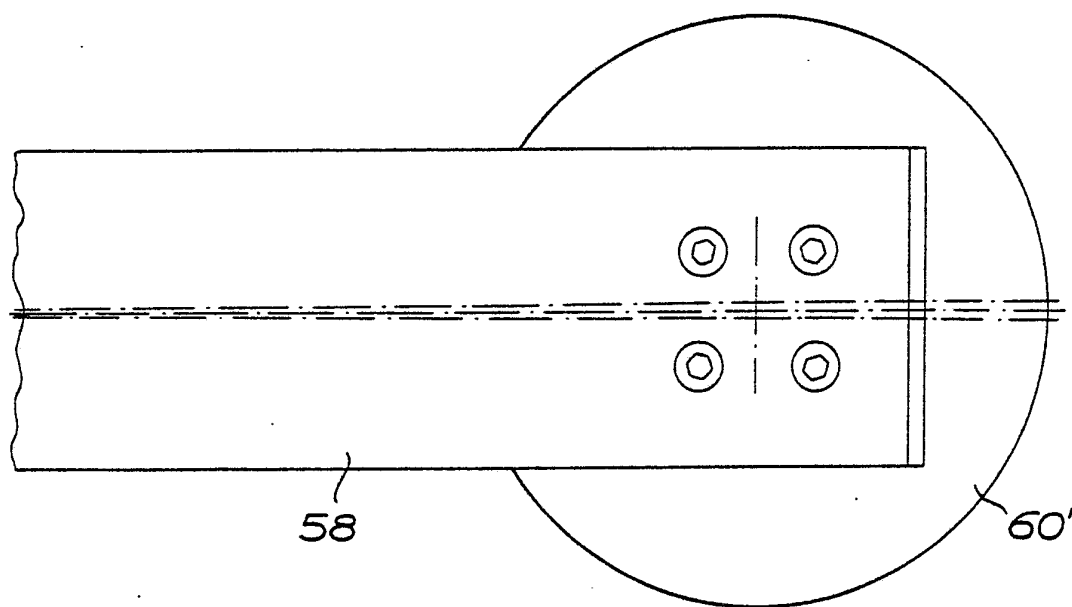


FIG. 9

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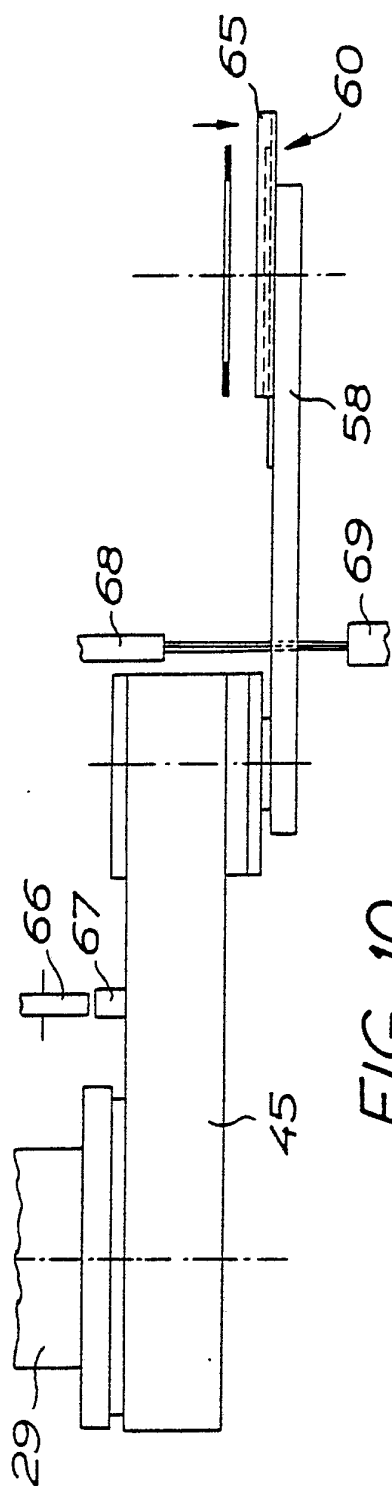


FIG. 10

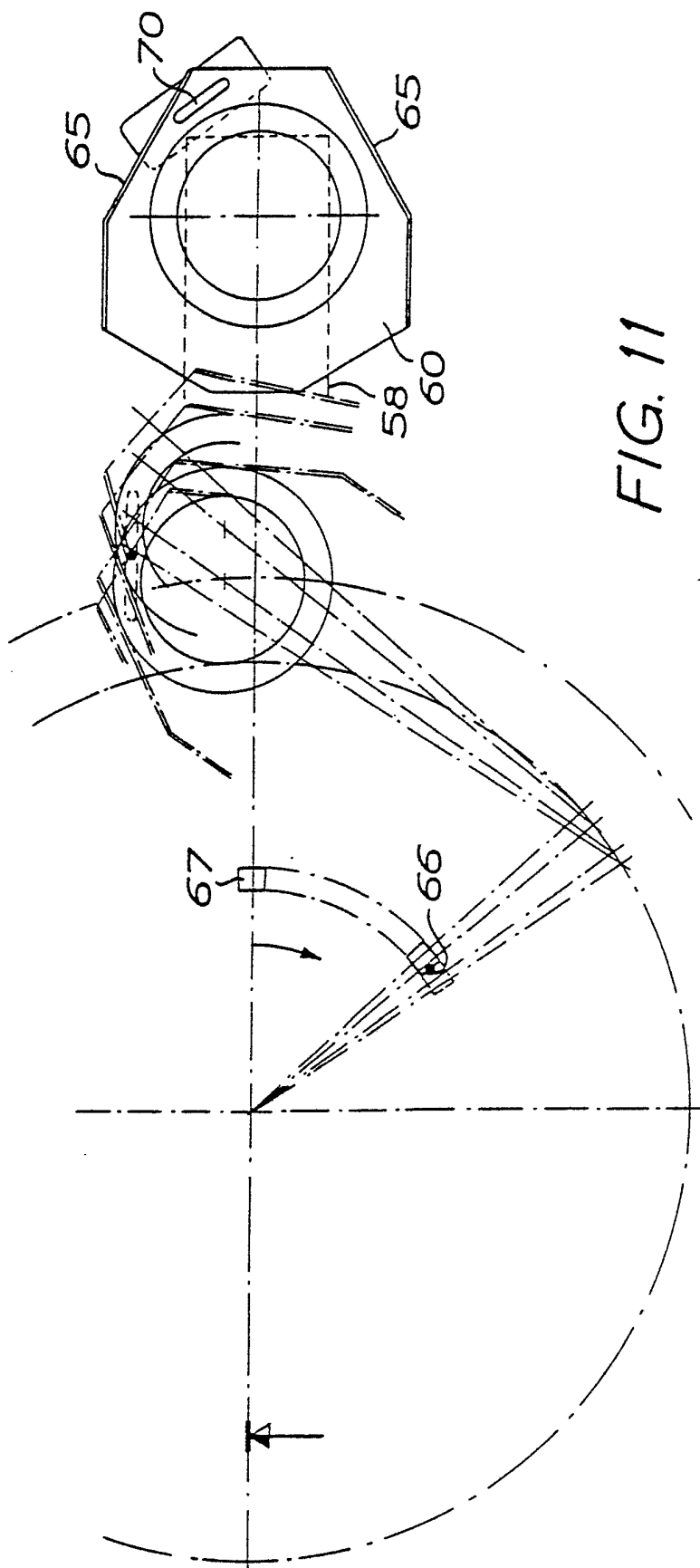


FIG. 11

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE81/00079

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ¹ According to International Patent Classification (IPC) or to both National Classification and IPC ³ B 30 B 15/30, 1/26																																
II. FIELDS SEARCHED Minimum Documentation Searched ⁴ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 30%; border-bottom: 1px solid black;">Classification System</th> <th style="border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td>IPC 3</td> <td>B 30 B 15/30, 1/26, B 25 J</td> </tr> <tr> <td>National Cl</td> <td>58b:7, 17; 35b:6/25</td> </tr> <tr> <td>US Cl</td> <td>214:1; 100:215-218</td> </tr> </table> Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵ SE, NO, DK, FI classes as above			Classification System	Classification Symbols	IPC 3	B 30 B 15/30, 1/26, B 25 J	National Cl	58b:7, 17; 35b:6/25	US Cl	214:1; 100:215-218																						
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National Cl	58b:7, 17; 35b:6/25																															
US Cl	214:1; 100:215-218																															
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴ <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <th style="width: 10%; border-bottom: 1px solid black;">Category ⁶</th> <th style="width: 70%; border-bottom: 1px solid black;">Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷</th> <th style="width: 20%; border-bottom: 1px solid black;">Relevant to Claim No. ¹⁸</th> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>SE, C, 375 724 published 1975, April 28, AB Volvo</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>DE, C, 538 634 published 1931, November 5, Ernst Haase</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>DE, C, 2 412 569 published 1974, September 26, Daikin Kogyo Co Ltd.</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>DE, C, 2 531 760 published 1977, April 7, Sebastian Messerschmidt</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>FR, B, 2 427 884 published 1978, November 9, Shiroyama Kogyo Kabushiki Kaisha</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>FR, B, 2 427 883 published 1978, November 27, Shiroyama Kogyo Kabushiki Kaisha</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>US, A, 3 731 820 published 1973, May 8, Nagoya Kiko Co. Ltd.</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>GB, A, 281 901 published 1927, February 14, Fawcett Ltd.</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>GB, A, 1 170 826 published 1967, September 27, L. Schuler GmbH.</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> </table> ¹⁵ Special categories of cited documents: ¹⁹ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "Z" document member of the same patent family			Category ⁶	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸	A	SE, C, 375 724 published 1975, April 28, AB Volvo	1	A	DE, C, 538 634 published 1931, November 5, Ernst Haase	1	A	DE, C, 2 412 569 published 1974, September 26, Daikin Kogyo Co Ltd.	1	A	DE, C, 2 531 760 published 1977, April 7, Sebastian Messerschmidt	1	A	FR, B, 2 427 884 published 1978, November 9, Shiroyama Kogyo Kabushiki Kaisha	1	A	FR, B, 2 427 883 published 1978, November 27, Shiroyama Kogyo Kabushiki Kaisha	1	A	US, A, 3 731 820 published 1973, May 8, Nagoya Kiko Co. Ltd.	1	A	GB, A, 281 901 published 1927, February 14, Fawcett Ltd.	1	A	GB, A, 1 170 826 published 1967, September 27, L. Schuler GmbH.	1
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IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 50%; border-bottom: 1px solid black; vertical-align: top;"> Date of the Actual Completion of the International Search ² 1981-11-09 </td> <td style="width: 50%; border-bottom: 1px solid black; vertical-align: top;"> Date of Mailing of this International Search Report ² 1981-11-11 </td> </tr> <tr> <td style="border-bottom: 1px solid black; vertical-align: top;"> International Searching Authority ¹ Swedish Patent Office </td> <td style="border-bottom: 1px solid black; vertical-align: top;"> Signature of Authorized Officer ²⁰ Hans Hagström </td> </tr> </table>			Date of the Actual Completion of the International Search ² 1981-11-09	Date of Mailing of this International Search Report ² 1981-11-11	International Searching Authority ¹ Swedish Patent Office	Signature of Authorized Officer ²⁰ Hans Hagström																										
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