



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 0 941 834 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
15.09.1999 Bulletin 1999/37

(51) Int. Cl.⁶: **B30B 15/00**

(21) Application number: **98104093.4**

(22) Date of filing: **09.03.1998**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(71) Applicant:
**Battaglia Bergomi, Claudia
6914 Ciona di Carona (CH)**

(72) Inventors:
• **Guarino, Renato
Napoli (IT)**

• **Del Gaudio, Gennaro
Pompei (Napoli) (IT)**
• **Picone, Giulio
Parma (IT)**

(74) Representative: **Negrini, Elena
Agazzani & Associati S.r.l. & Studio Ing.
Giampaolo Agazzani,
Via dell'Angelo Custode 11/6
40141 Bologna (IT)**

(54) **adjustment device of the stroke pressure in a conversion press**

(57) In a press for converting shells into easy-open covers for food cans, constituted by a bed (26), supporting a lower die shoe (5), four uprights (4) provided with longitudinal guides (21) and a crown (1), supported by the uprights (4) and provided with motion members (30) of a ram (3) supporting an upper die shoe (6) alternatively brought in operative contact with the lower die shoe (5), said crown (1) and bed (26) being constrained through connecting rods (9), an adjustment device (40) of the press stroke pressure comprises a bolster (10), constituted by an upper plate (10a) and a lower one (10b), mutually connected through guides (11); spacer

members (70), put between the lower plate (10b) and the upper plate (10a), and fit to vary their mutual distance; sensor members (7), joined to the uprights (4) and fit to detect longitudinal dimensional variations of these latter; control and command means (50) fit to elaborate the signals from the sensor members (7) and consequently to activate the spacer means (70) in such a way to contrast and compensate the dimensional variations of the uprights (4) allowing a mutual stroke pressure dynamic regulation of the press (100).

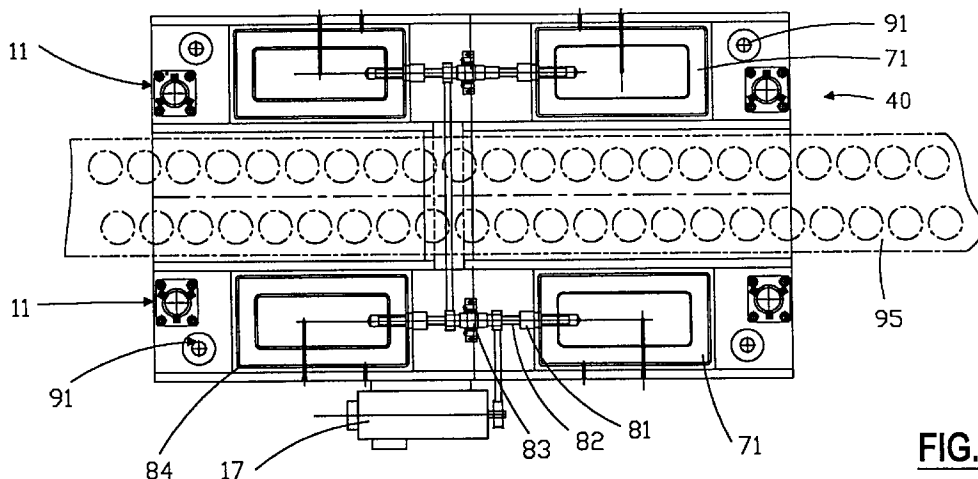


FIG. 3

EP 0 941 834 A1

Description

[0001] The present invention relates to conversion presses.

[0002] Particularly the invention concerns an adjustment device of the stroke pressure in conversion presses for converting stock shells into easy-open covers used as closing ends for drink and food cans and the like, although it is understood that the invention is also applicable to presses for working stocks of different kinds.

[0003] Conversion presses for semi-raw shells are known, comprising fixtures designed for converting such shells in easy-open covers, by virtue of a tab application that allows the opening of the cover.

[0004] Known presses generally include a bed that supports lateral uprights on which is fastened, by means of tie rods extending through the uprights, a crown that generally supports the main drive of the press motion members.

[0005] Sliding support guides for a ram, which supports the tools of the press upper die shoe, are connected to the uprights.

[0006] These tools are fit to co-operate with correspondent tools of a lower die shoe, supported by the bed, so forming a series of work stations for the shells.

[0007] These latter are for instance placed in succession in housings of a conveyor belt that carries the shells through the press dies, moving them station by station, so allowing the progressive shell conversion into covers by means of cyclical stroke of the upper die shoe onto the lower.

[0008] The main disadvantage of known presses is that the elevated stroke rate and the elevated work effort connected to the press operating cause member elastic deformations of the presses, principally the movement deformation. Moreover there are elongation effects by thermal expansion for such members.

[0009] In fact, during the press running, a part of energy needed for member motion has an heat dissipation inevitably transmitted to the members causing a dimensional variation thereof, particularly a longitudinal elongation.

[0010] Such variations are also found during the press stop required periodically for cleaning or maintenance because of jams, such as for instance feeding the press with the tab belt.

[0011] Particularly the uprights, the crown, the ram and besides the main component of the driving members like for instance the connecting rods and the crankshaft are influenced differently by thermal effect variations: mostly these elements contribute to the distance variation between the upper and lower die shoe tools.

[0012] The above said effects can reduce the precision and the dimensional stability of the press during the whole productive cycle, and therefore must be reduced or even eliminated.

[0013] For instance, the press stroke pressure varies during the productive cycle in consequence of the working space variation between the upper and the lower die shoe tools: this fact influences the shell working, particularly on scoring depth of their output or opening inlet and therefore on the qualitative level of formed covers.

[0014] Besides the different stroke pressure supply involves an increasing of noisiness and vibrations of the press.

[0015] This problem is commonly resolved heating the connecting rods causing their elongation so balancing the upright elongation happening progressively during the press running.

[0016] Other known technique, complementary to the preceding one for resolving this drawback, is to check the press circulation oil temperature by heating or cooling it as needed.

[0017] Nevertheless, the drawback is not yet resolved since it is difficult to check the elongation of the moving members through a thermal balancing (inducing their heat decrease or increase), and therefore the stroke pressure of the upper die shoe onto the seats of the lower one is different during the press working cycle.

[0018] Besides, since the required time for inducing temperature variations are rather long, only partially is possible to compensate the drawbacks made for formed cover.

[0019] The main object of the present invention is therefore to propose a device for conversion presses fit to check and regulate the press stroke pressure compensating thermal expansion and elastic deformation effects to which the main press components are submitted during its running.

[0020] Other object of the present invention is to propose a device able to check and correct continuously the press stroke pressure with quick response times.

[0021] Further object of the present invention is to propose a device of easy realization and reliable running and maintenance.

[0022] The above mentioned objects are reached according to the claims.

[0023] The features of the present invention are underlined in the follow with reference to attach drawing tables, where:

- figure 1 shows a frontal view of a conversion press having the device object of the present invention;
- figure 2 shows a side view of the press in figure 1;
- figure 3 shows a plan view of the adjustment stroke device of the press in figure 1;
- figure 4 shows a partially sectioned side view of device in figure 3, in which some portions has been removed for better showing others;
- figure 5 shows a block diagram relative to the driving of the device in figure 3.

[0024] With reference to figures from 1 to 4, numeral 40 refers to a stroke pressure adjustment device in a

conversion press 100 of shells into easy-open covers for drink or in general food cans.

[0025] The press 100 includes a bed 26, a crown 1, and uprights 4.

[0026] The bed 26, put on the ground by means of supports 20, supports a bolster 10, on which are fixed a lower die shoe 5 and four uprights 4, not interacting with the bolster 10, placed at the bolster 10 sides and provided with longitudinal guides 21 turned toward the inside of the press 100.

[0027] The crown 1 is supported by the uprights 4 and is provided with motion members 60 of a ram 3, sliding by means of the longitudinal guides 21 and supporting an upper die shoe 6.

[0028] Lower 5 and upper 6 die shoes normally support dies or tooling destined to progressive conversion of the shells into covers provided with tear tab.

[0029] Between the two die shoes, lower 5 and upper 6, a conveyor belt of the shells slides longitudinally, that are progressively converted into formed covers by means of the cyclical stroke of the upper die on the lower one.

[0030] Inside each upright 4 is housed a connecting rod that maintains mutually constrained the crown 1 and the bed 26.

[0031] The rectangular shaped bolster 10 includes an upper plate 10a, supporting the lower die shoe 5, and a lower plate 10b, fixed to the bed 26.

[0032] The plates, upper 10a and lower 10b, are mutually connected by means of guides 11, placed near the plate edges. Each guide is essentially constituted by a cylindrical pivot, connected with the upper plate 10a by means of a spherical cage 31 and a bush 32 and with the lower plate 10b by means of an housing hole made in this latter.

[0033] Between the upper plate 10a and lower plate 10b, spacer members 70 are interposed, that include two couples of opposed movable wedge elements 71 co-operating with correspondent fixed wedge elements 72 locked to the upper plate 10b inside surface.

[0034] Such couples of movable wedge elements 71 are driven by motion means 80 that include, for each couple, a threaded rod 82 supported by a bracket 83 fixed to the lower plate 10b and rotating by operating a motor member 17.

[0035] The ends of each threaded rod 82 are engaged in correspondent threaded nuts 81, each fixed to the side wall of every movable wedge element 71.

[0036] The threaded rod 82 has opposed threads in such a way that the rotation of said rod causes the mutual distance variation between the movable wedges 41.

[0037] Between the contact surfaces of the wedge elements 71 with the lower plate 10b and the correspondent wedge elements 72 of the upper plate 10a hydrostatic sumps are carried out delimited by an hydrostatic sump boundary conduct 84.

[0038] The bolster 10 comprises moreover reaction

members 90 put between the upper 10a and lower 10b plates.

[0039] Such reaction members 90 include four pistons 91, placed near the edges of plates forming the bolster 10, each having an end locked at the upper plate 10a and the other end widened and housed within a seal box 92 made in the lower plate 10b and containing a pressure fluid.

[0040] The stoke adjustment device 40 includes more-over sensor members 7 placed on the uprights 4 and fit to detect their longitudinal dimensional variations.

[0041] The sensor members 7 are constituted by electric elongation sensors joined to the uprights 4, for instance they are particular resistances called "strain gauge".

[0042] With particular reference to figure 5, the device 40 includes also control and command means 50 that receive in input the signals of the sensor members 7 and send a control signal, through an estensimetric device 8, to a comparator 16 between this last signal and a reference signal 19 pre-established in the device, fit to provide a operating signal to the motor member 17 that therefore starts the spacer members 70.

[0043] The running of the device 40 is simple because, once the press 100 is operated, the sensor members 7 send a signal proportional to the elongation (or shrinkage) of the uprights 4 to the estensimetric device 8 that sends a control signal to a comparator 16 that compares between this last signal with a reference signal 19 pre-established in the device.

[0044] This comparator 16 sends a signal to the motor member 17 that drives the threaded rods 82 rotating them inside the threaded nuts 81 of each movable wedge 71.

[0045] The axial shifting of these nuts 81 change in turn the longitudinal position of the movable wedges 71 bound thereto. Particularly the moving away of the movable wedges 71 causes a push on the upper plate 10a, that determines its vertical shifting.

[0046] The mutual movements between the movable wedges 71 and the fixed wedges 72 and between the movable wedges 71 and the lower plate 10b are facilitated by an hydrostatic support system, obtained by means of the insertion of pressure oil inside the hydrostatic sumps.

[0047] The reaction members 90, opposing to the upper plate 10a vertical shifting, guarantee a correct positioning within the normal running limits.

[0048] Such opposition is got by means of the action made on the piston 91 heads by the pressure fluid contained in the seal box 92, that pushes down these heads, in contrast with the raising of the upper plate through the spacer means 70.

[0049] In such a way the stroke or closing pressure of the press 100 is dynamically regulated.

[0050] In a variant of the device 40 the sensor members 7 are constituted besides by load cells 23 placed under the bolster 10 and are fit to send a signal propor-

tional to the stroke pressure of the press 100 to the control and command means 50 so as to regulate the stroke pressure, in feedback, by means of the activation of the spacer means 70.

[0051] It is besides advantageous to point out that the conveyer belt 95, returning from the working area between the upper die shoe and the lower die shoe, longitudinally slides between the couples of movable guides 71.

[0052] It is also useful to point out that the two threaded rods 82 are connected by a mechanism, for instance through a chain, and connected to the motor member 17 that can be, for instance, a step by step motor.

[0053] The main advantage of the present invention is therefore to provide a device for conversion presses fit to check and regulate the press stroke pressure compensating thermal expansion and elastic deformation effects to which the main press moving component are submitted during the press operating.

[0054] Other advantage of the present invention is to provide a device fit to check and correct continuously the press stroke pressure, varying the upper plate position, with rapid response times.

[0055] Ulterior advantage of the present invention is to provide a device of easy realization and reliable operation and maintenance.

[0056] The present invention has been described, with reference to attached drawings, only as an example, not limitative, and it is evident that all modification or variation suggested by the experience as well as its realization and use, however included within the following claims.

Claims

1. Control device for the stroke of a conversion press of semi-raw shells into easy-open covers for drink or general food cans, with said press (100) comprising:

- a bed (26), supporting at least a lower die shoe (5) and at least two uprights (4), not interacting with said lower die shoe (5), and provided with longitudinal guides (21);
- a crown (1), supported by said uprights (4) and provided with motion members (60) of a ram (3), slidably driven by said longitudinal guides (21) and supporting at least an upper die shoe (6) alternatively brought into operative contact with said lower die shoe (5); said crown (1) and bed (26) being constrained by means of connecting rods (9) locked at the ends; said device being characterized in that comprises:
 - at least a bolster (10), including an upper plate (10a) and a lower plate (10b), mutually connected by means of at least a guide (11);

- spacer members (70), put between said lower plate (10b) and said upper plate (10a), and fit to vary their mutual distance;
- sensor members (7), joined to said uprights (4), fit to detect longitudinal dimensional variations of these latter;
- control and command means (50) fit to elaborate the signals of said sensor members (7) and consequently to operate said spacer means (70) in such a way to contrast and compensate the dimensional variations of said uprights (4) allowing a mutual stroke pressure dynamic regulation of said press (100).

2. Device according to claim 1, characterized in that comprises besides reaction members (90) put between said upper (10a) and lower (10b) plate and fit to control their mutual distance.

3. Device according to claim 2, characterized in that said reaction members (90) include at least a couple of pistons (91) with an end locked at said upper plate (10a) and the remaining widened end is housed within a seal box (92) made in said lower plate (10b) and containing a pressure fluid opposing the increase of the distance between said upper plate (10a) and lower (10b) with the cooperation of said spacer members (70).

4. Device according to claim 1, characterized in that said spacer means (70) include at least a movable wedge element (71) co-operating with at least a corresponding fixed wedge element (72) locked to the inside surface of at least one of said lower (10b) or upper (10a) plates, said movable wedge (71) shifting by motion means (80) controlled by said control and command means (50).

5. Device according to claim 4, characterized in that between said movable (71) and fixed (72) wedge element is inserted a lubrication fluid in such a way to reduce the friction between them.

6. Device according to claim 4, characterized in that said motion means (80) include a threaded nut (81), fixed to the side wall of said movable wedge element (71), in which a threaded rod (82), supported by a bracket (83) fixed to said lower plate (10b) and rotating by means of a motor member (17), is engaged.

7. Device according to claim 6, characterized in that include two couples of movable wedge elements (71), with two movable wedges (71) of each couple mutually connected by means of said rod (82) having opposed thread in such a way that the rotation of said rod (82) causes the variation of the mutual distance between said two movable wedges (71).

8. Device according to claim 1, characterized in that said sensor members (7) are constituted by electric elongation sensors joined to said uprights (4).

9. Device according to claim 1, characterized in that includes besides load cells (23) placed under said bolster (10) and fit to send a signal proportional to the stroke pressure of said press (100) to said control and command means (50).

10. Device according to anyone of the preceding claims characterized in that said control and command means (50) receive in input the signals from said sensor members (7) or said load cells (23) and send, by means of an estensimetric device (8), at least a control signal to a comparator (16) between this latter signal and a reference signal (19), fit to provide an operating signal to a motor member (17) moving said spacer members (70).

10

15

20

25

30

35

40

45

50

55

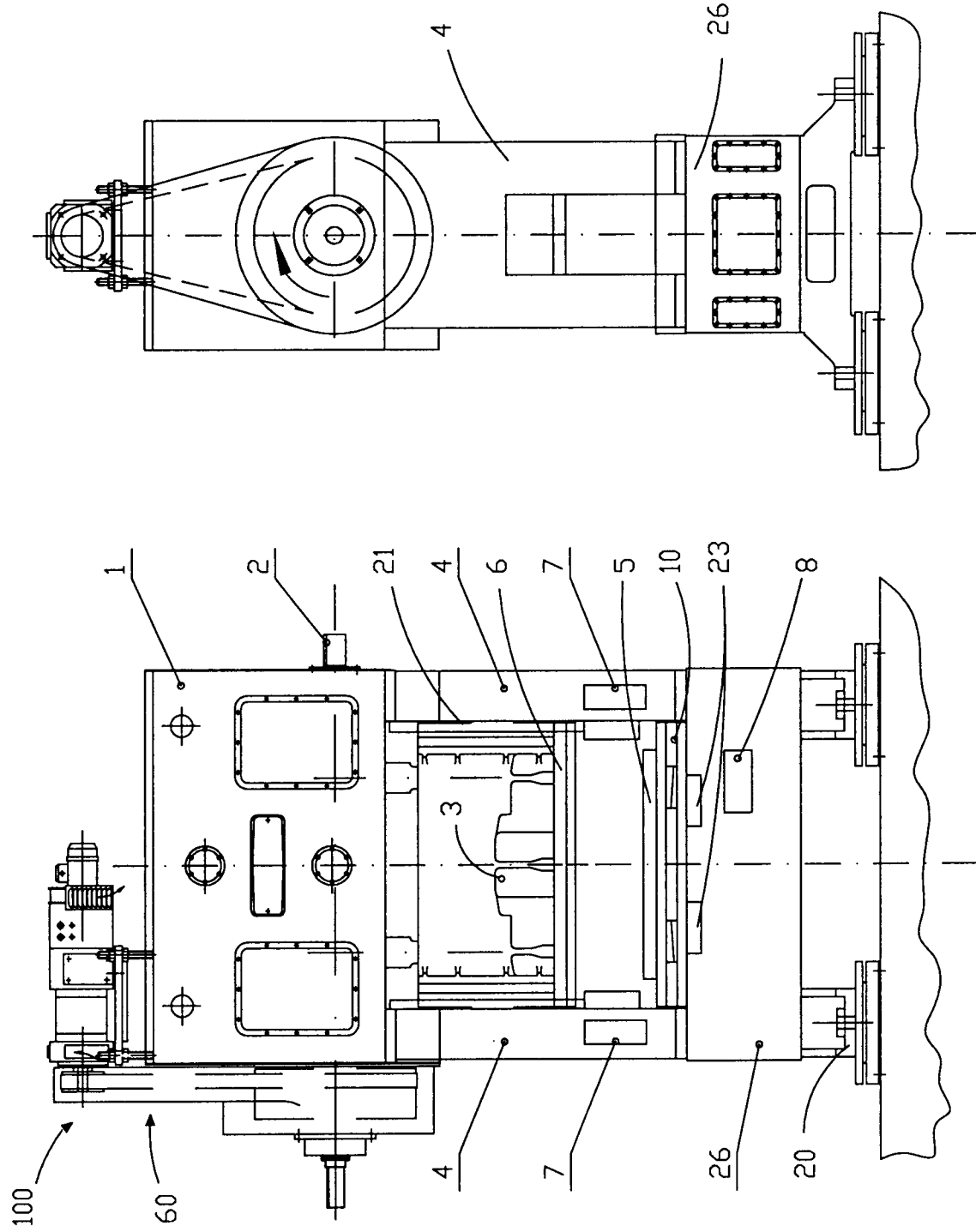


FIG. 2

FIG. 1

FIG. 4

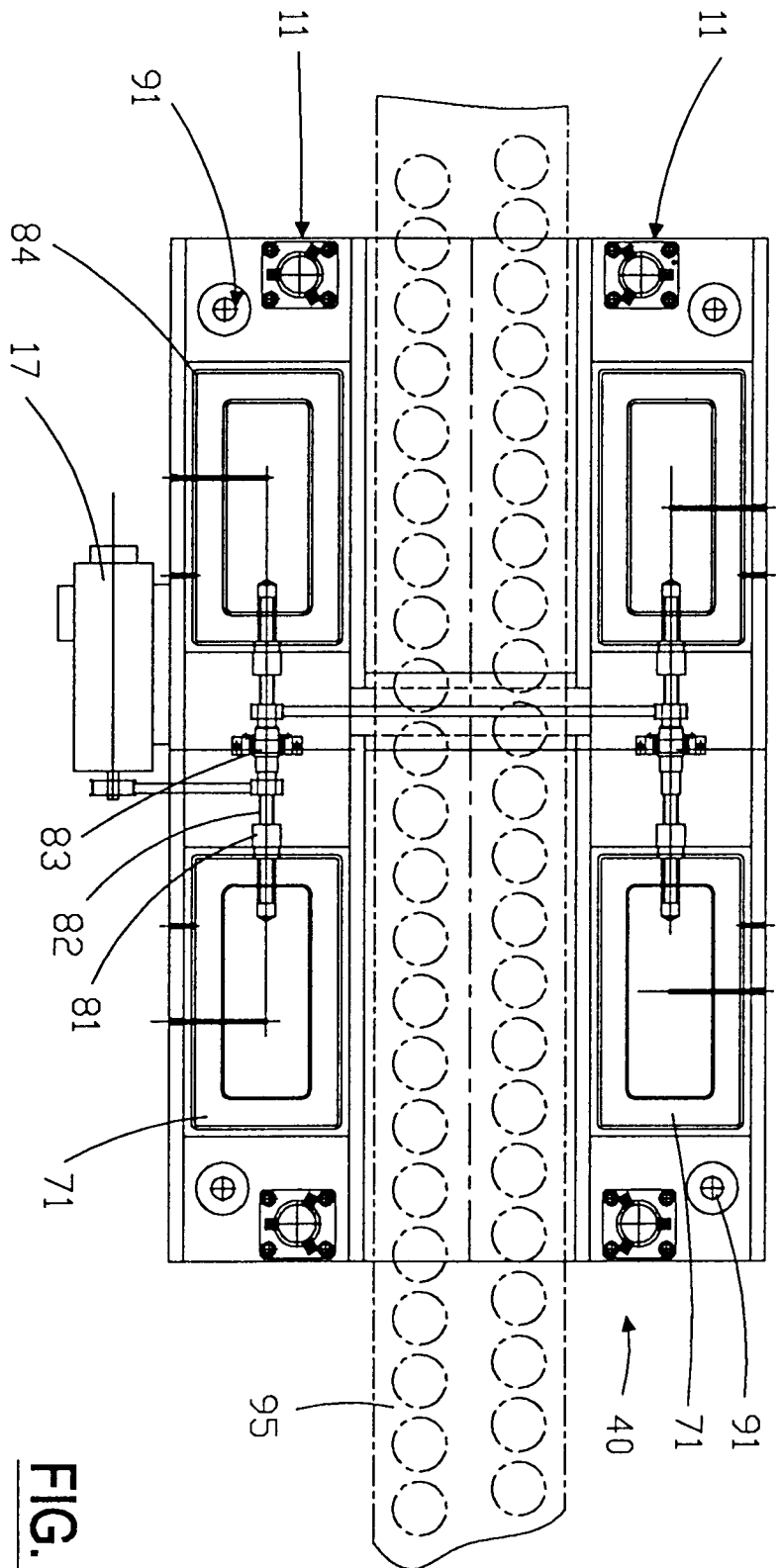
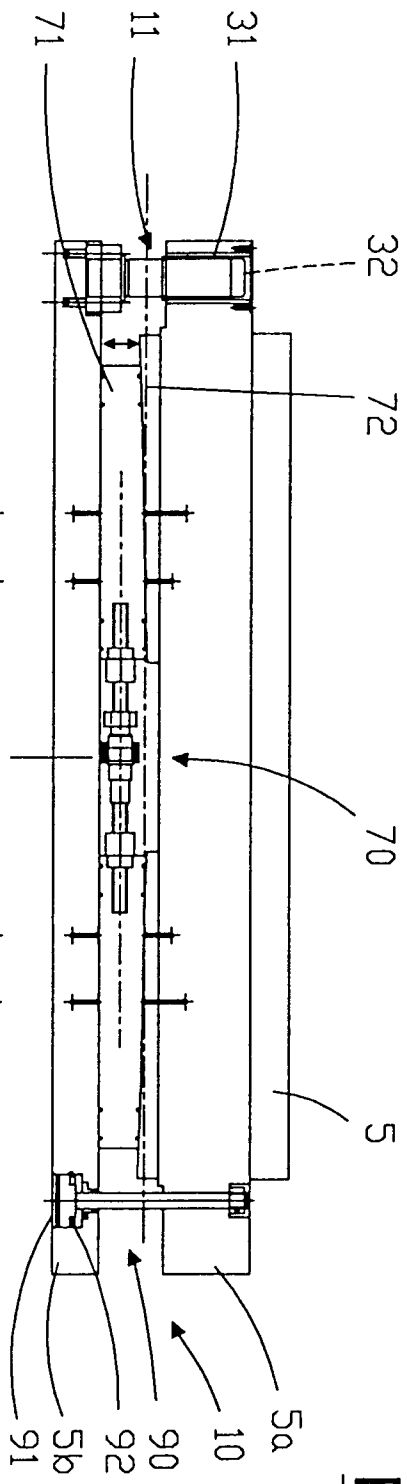


FIG. 3

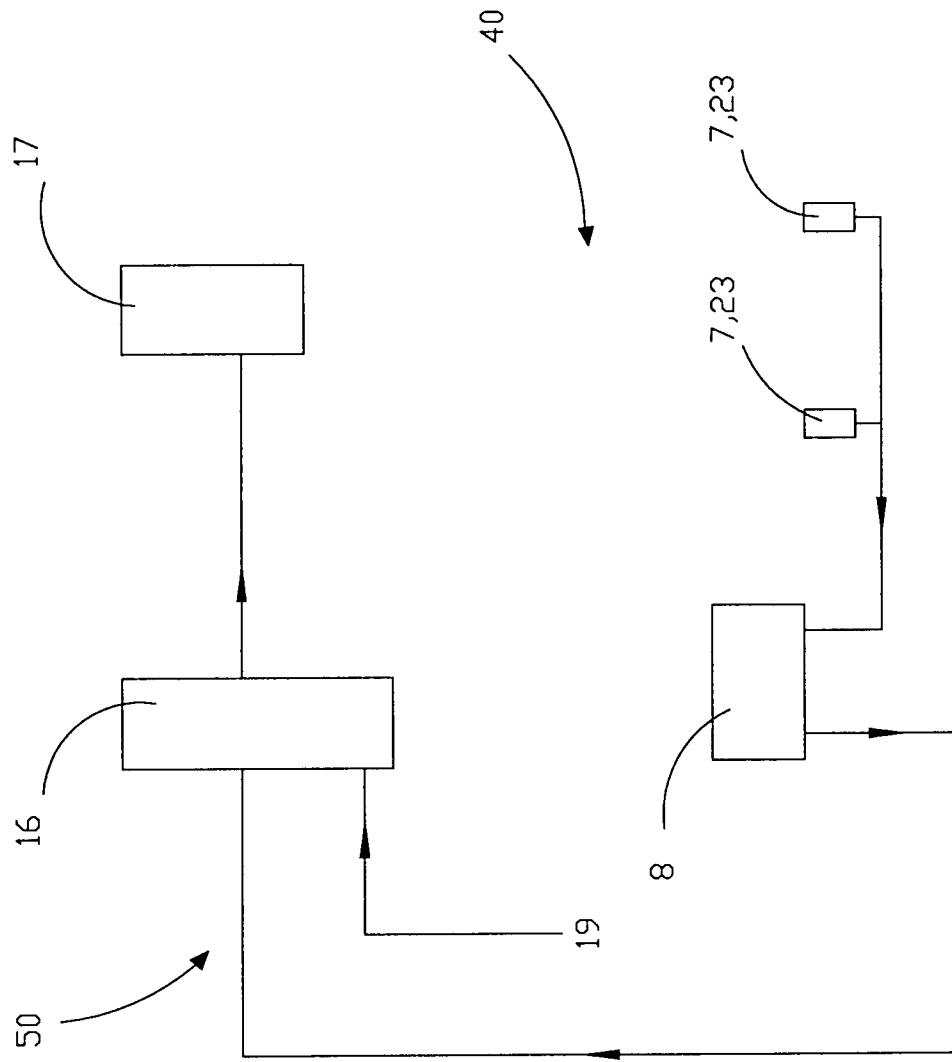


FIG. 5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 10 4093

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 741 001 A (GIETZ AG) 6 November 1996	1,4,6,8-10	B30B15/00
Y	* claims 1-4; figures 1-3 *	2,3,5,7	
Y	US 3 889 515 A (GROMBKA WALTER J) 17 June 1975 * column 3, line 49 - column 4, line 2 * * column 4, line 33 - line 49; figures 2-4 *	2,3,5	
Y	DE 20 39 644 A (L. SCHULER GMBH) 23 March 1972 * figures *	7	
X	US 4 918 956 A (SCHUCH DANIEL A) 24 April 1990 * abstract; figures *	1,4,6,9,10	
A	EP 0 459 224 A (SIEMENS AG) 4 December 1991 * column 2, line 48 - line 11; claim 1; figure 1 *	1,8-10	
A	EP 0 596 697 A (TOYOTA MOTOR CO LTD) 11 May 1994 * abstract; figures 1,6 *	1,8-10	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	US 5 609 099 A (BURNS BRADLEY A ET AL) 11 March 1997 * claims; figure 4 *	1,5	B30B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 7 January 1999	Examiner Belibel, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 10 4093

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

07-01-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0741001 A	06-11-1996	US 5746122 A	05-05-1998
US 3889515 A	17-06-1975	DE 2530400 A	05-02-1976
		GB 1495634 A	21-12-1977
		JP 51036677 A	27-03-1976
DE 2039644 A	23-03-1972	NONE	
US 4918956 A	24-04-1990	US 4939918 A	10-07-1990
		DE 3881985 A	29-07-1993
		DE 3881985 T	18-11-1993
		EP 0304623 A	01-03-1989
		US 4945742 A	07-08-1990
EP 0459224 A	04-12-1991	DE 59106253 D	21-09-1995
		JP 4228297 A	18-08-1992
		US 5297478 A	29-03-1994
EP 0596697 A	11-05-1994	JP 6312299 A	08-11-1994
		JP 2753675 B	20-05-1998
		JP 6190464 A	12-07-1994
		JP 2711980 B	10-02-1998
		JP 6190465 A	12-07-1994
		JP 6143000 A	24-05-1994
		CA 2102363 A,C	07-05-1994
		DE 69309610 D	15-05-1997
		DE 69309610 T	11-09-1997
		DE 69313585 D	09-10-1997
		DE 69313585 T	19-02-1998
		EP 0596696 A	11-05-1994
		EP 0773075 A	14-05-1997
		US 5450756 A	19-09-1995
		CA 2102360 A	06-05-1994
		US 5457980 A	17-10-1994
US 5609099 A	11-03-1997	JP 9192899 A	29-07-1997