



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.11.2001 Bulletin 2001/47

(51) Int Cl.7: **B21D 5/02**

(21) Application number: **01201783.6**

(22) Date of filing: **14.05.2001**

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

(71) Applicant: **ABIEMME S.r.L.**
29010 Rottofreno (PC) (IT)

(72) Inventor: **Gianelli, Giuseppe Vittorio**
20010 S. Pietro all'Olmo (MI) (IT)

(30) Priority: **16.05.2000 IT MI001083**

(74) Representative: **Arena, Giovanni**
Viale Certosa 135
20151 Milano (IT)

(54) **Pneumatic control system for quick clamping of cornice brake tools**

(57) The quick tool clamping system of the present invention relates to a cornice brake in which there are rows of punches and dies and modular units consisting of intermediates and clamping jaws for the intermediates and jaws for clamping punches, with the latter being operated by actuators driven by pneumatic cylinders, and is characterized in that:

- a) in the intermediates and the jaws clamping the intermediates to the cursor of the press there are channels for feeding of the fluid under pressure to the actuator cylinder,
- b) said channels lead to at least one hole opening onto the opposing surfaces of each pair of intermediates and associated clamping jaw,
- c) on at least one of the two opposing surfaces of each pair of intermediates and associated clamping jaw the associated hole opens onto a groove running horizontally in the surface and positioned at the same level as the hole opening onto the opposing surface, and
- d) in the circuit for supplying the fluid under pressure to every intermediate a valve is inserted designed to intercept the flow of fluid towards the intermediate.

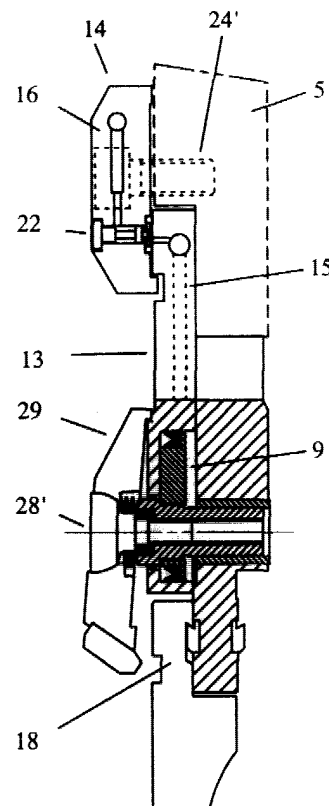


Fig.4

Description

The Field of the Invention

[0001] The present invention relates to a pneumatic control system for quick clamping, release, withdrawal and change of cornice brake tools.

Background of the Invention

[0002] For cold working of sheet metal work pieces by bending, presses termed "cornice brakes" using appropriately shaped pairs of tools (punches and dies) are commonly used. In these machines the various processing steps require frequent replacement or lateral shifting of the tools. These operations are usually performed either by completely manual procedures which require long pauses for loosening and then clamping of numerous modular unit bolts for clamping the tools, or with the aid of clamping and unclamping systems for the modular units with automatic hydraulic or pneumatic control. When the punch tip which is opposite the bending axis is not positioned on the axis of the punch tang which clamps the punch to the press cursor the use of adaptor or intermediate modules termed "extensions" or "intermediates" which act as punch lengthening members is required.

[0003] Known pneumatic control systems for quick clamping of tools are described in European patent no. 0 754 506, in Italian patent application no. M198A 001084 and in sales pamphlet "Quick tool change on cornice brakes" of the Teda s.r.l. company with seat in Piacenza, Italy.

[0004] These known systems call for modular tool clamping and unclamping units comprising punch clamping jaws and actuators driven by pneumatic cylinder fed through channels in the body of the intermediates and through tubes running between the intermediates of each pair of intermediates placed side by side. These tubes are capable of running with compressed air seal within the above cavities so as to allow limited lateral traversing of the intermediates along the front of the brake before they are clamped.

[0005] These systems do not give rise to particular problems if the work to be performed on the brake does not require removal of the intermediates. But if this removal is required it is necessary to remove together with the intermediates each pair of the above mentioned tubes inserted in the intermediates removed and then install a tube of sufficient length in place of each intermediate and each pair of tubes removed. These removal and replacement operations cause loss of time.

Summary of the Invention

[0006] The general purpose of the present invention is to produce a pneumatic system for quick tool clamping in cornice brakes which would not require tubes for sup-

ply of fluid under pressure running between the intermediates and which would allow quick removal of the intermediates. Another purpose of the system is to allow installation of punches not requiring intermediates or installation of intermediates for manual clamping the punch tang on the intermediate.

[0007] The quick tool clamping system of the present invention relates to a cornice brake in which there are rows of punches and dies and modular units consisting of intermediates and clamping jaws for the intermediates and jaws for clamping punches, with the latter being operated by actuators driven by pneumatic cylinders, and is characterized in that:

- a) in the intermediates and the jaws clamping the intermediates to the cursor of the press there are channels for feeding of the fluid under pressure to the actuator cylinder,
- b) said channels lead to at least one hole opening onto the opposing surfaces of each pair of intermediates and associated clamping jaw,
- c) on at least one of the two opposing surfaces of each pair of intermediates and associated clamping jaw the associated hole opens onto a groove running horizontally in the surface and positioned at the same level as the hole opening onto the opposing surface, and
- d) in the circuit for supplying the fluid under pressure to every intermediate a valve is inserted designed to intercept the flow of fluid towards the intermediate.

[0008] In accordance with a variation the groove running horizontally is missing and the holes opening onto the opposing surfaces of each pair of intermediates and associated clamping jaw are mutually opposed.

Brief Description of the Drawings

[0009] To better explain the innovative principles of the present invention and its advantages there is described below with the aid of the annexed drawings possible embodiments thereof by way of nonlimiting example.

[0010] In the drawings:

FIG 1 shows a perspective view of work stations of a cornice brake of known type with pneumatic quick clamping of tools,

FIG 2 shows a cross section view of a work station (upper part) of FIG 1,

FIG 3 shows the work station of FIG 1 without the upper tools of the middle station,

FIG 4 shows a cross section view of an intermediate and of the punch and intermediate clamping jaws in accordance with an embodiment of the quick clamping system of the present invention,

FIG 5 shows a view from the right of the jaw 14 of

FIG 4,
 FIG 5a shows an enlarged view of a detail of FIG 5,
 FIG 6 shows a view from the left of the intermediate
 13 and the jaw 29 of FIG 4, and
 FIGS 7 to 9a show cross section views of the compo-
 nents 5, 13 and 14 of FIG 4 in accordance with
 two variants of the valve 22 of the same FIG.

Detailed Description of the Preferred Embodiments

[0011] FIGS 1, 2 and 3 relate to a known quick tool
 clamping and unclamping system with pneumatic con-
 trol of the type described in the above mentioned docu-
 ments.

[0012] In FIG 1 the different parts represent:

1. dies
2. punches
3. intermediates
4. manual clamping jaws for clamping the interme-
 diates to the cursor 5 of the press,
6. pneumatic control jaws for clamping the punch
 tang to the intermediates,
7. tubes (shown in broken lines) for supply of fluid
 under pressure, running between the intermedi-
 ates, and
8. hole for supply fluid under pressure in the inter-
 mediates.

[0013] FIG 2 (corresponding to FIG 4 of the above
 mentioned Italian patent application no. M198A001084)
 shows a cross section of the pneumatic punch clamping
 system of FIG 1.

[0014] In accordance with this system the fluid under
 pressure, for example air, controls the pneumatic cylin-
 der 9 (made in the intermediate body) through the chan-
 nel 8' and the duct 10. When the fluid comes under pres-
 sure the piston 11 of the pneumatic cylinder moves to-
 wards the right and cause clamping of the jaw 6' against
 the tang of the punch 2'.

[0015] FIG 3 shows the case in which the press of FIG
 1 requires removal of a punch (the center one in the FIG)
 and associated intermediate to allow special bending.
 In this event it is necessary to remove, together with the
 middle intermediate, the two tubes supplying fluid under
 pressure and connecting the intermediate to those be-
 side it and then replace the two tubes with a single tube
 12 to restore the connection of the intermediates 3' and
 3".

[0016] FIGS 4, 5 and 6 show a pneumatic system for
 quick clamping and unclamping, withdrawal and change
 of tools in accordance with the present invention.

[0017] This system displays the following main fea-
 tures:

- a) each intermediate 13 and in the associated jaw
 14 for clamping the intermediate to the cursor 5 of
 the press there are channels 15 and 16 for feeding

the fluid under pressure to the actuator cylinder 9
 controlling clamping of the tang 18 of the punch
 against the intermediate,

b) the above mentioned channels lead to a respec-
 tive hole 19, 20 opening onto the opposing surface
 of the intermediate and of the clamping jaw,

c) on one of the two opposing surfaces and specifi-
 cally on the jaw surface the associated hole 20
 opens onto a groove 21 running horizontally in the
 surface and positioned at the same level as the hole
 19 opening onto the opposing intermediate surface,
 and

d) in the supply circuit of the fluid under pressure
 towards each intermediate a valve 22 designed to
 intercept the flow of fluid towards the intermediate
 is inserted.

[0018] As shown in FIG 5 (view from the right of the
 jaw 14) the system used for supplying fluid under pres-
 sure in the channel 16 calls for a serial supply of the
 clamping jaws 14 of the intermediates through tubes 23
 connecting together each side-by-side pair of jaws. This
 type of supply is not binding however because a non-
 serial but independent supply for the channel 16 of each
 jaw can be provided in a quite obvious manner.

[0019] In the same FIG reference number 24 design-
 ates the holes in which are inserted the screws 24' for
 clamping the jaw, and 25 designates two holes in which
 springs tending to withdraw the jaw from the cursor 5
 are housed.

[0020] FIGS 5 and 5a (the latter showing an enlarged
 view of the part of FIG 5 involved with the straight groove
 21) also show on the internal surface of the jaw an an-
 nular groove in which is inserted a seal 26 (rubber or
 other similar material) designed to ensure sealing of the
 fluid under pressure when the jaw 14 is clamped against
 the intermediate.

[0021] FIG 6 (showing a view from the left of the in-
 termediate 13 and the jaw 29) shows the path followed
 by the channel 15 for carrying fluid under pressure (en-
 tering from the hole 19) up to the chamber 27 of the
 pneumatic cylinder 9.

[0022] In the same FIG, 28 designates the holes for
 insertion of the pins 28' which allow clamping (with a
 horizontally pivoted movement) of the jaw 29.

[0023] FIGS 7 to 9a show the usefulness of the groove
 21 and two different ways of providing the valve 22 of
 FIG 4.

[0024] The version of FIGS 7 and 7a (the latter being
 an enlarged view of the part of FIG 7 surrounded by a
 circle in broken lines) concerns an embodiment of the
 valve 22 of the manually operated type. In this FIG the
 valve is shown open. It comprises a cylindrical chamber
 37 coaxial with the axis of the hole 20 and having a di-
 ameter greater than that of the hole. It also comprises
 an elastic seal ring 30 located on the bottom of the
 chamber and a small cylinder 31 fastened near the end
 of a screw 32 so as to be pressable against the ring 30

or withdrawable therefrom by screwing or unscrewing the screw.

[0025] FIG 7a shows the cylinder 31 spaced from the ring 30 so as to allow the discharge of the fluid under pressure from the hole 20 into the groove 21, the hole 19 and the channel 15, and the resulting clamping of the jaw 29 (FIG 4).

[0026] To ensure said clamping it is not necessary for the hole 19 to be exactly opposite the lower edge of the hole 20 but it is sufficient that it be opposite any point of the groove 21 (see FIGS 5 and 5a).

[0027] This makes it possible to allocate the intermediate on the front of the press to different positions within a range of variability equal to the length of the groove 21.

[0028] To use the press under operating conditions similar to those of FIG 3, i.e. with one or more intermediates uninstalled, it is sufficient to manually tighten the screw 32 until it compresses the seal ring 30 by means of the cylinder 31. By so doing, the stream of liquid under pressure towards the hole 20 is interrupted, the jaw 14 can be loosened manually and the intermediate 13 can be withdrawn without causing leakage of the fluid under pressure from the hole 20 during the subsequent starting up of the press.

[0029] The closed condition of the valve 22 not only allows withdrawal of the intermediate but allows use of conventional intermediates (without internal channel) or punches not requiring intermediates. Indeed, in these cases the jaw 14 behaves like a conventional jaw and operation under pneumatic control of the other positions of the press is not affected because closing of the hole 20 prevents falling of the fluid pressure.

[0030] FIGS 8 and 8a show a second version of the valve 32 and specifically a valve with automatic operation.

[0031] The valve is again structured like that of FIGS 7 and 7a except that the cylinder 31' is free to traverse in the chamber 37 and is pressed rightward by a spring 40. The rod 41 on which the cylinder 31' is fastened has its right end which in closed position of the valve (cylinder 31' pressed by the spring against the ring 30) emerges from the hole 20, while the same end when it is brought level with the outlet edge of the hole puts the valve in open position (FIG 8a).

[0032] Accordingly when the clamping screws 24' of the jaw 14 are loosened the jaw withdraws from the intermediate 13 and the valve closes automatically. As soon as the jaw 14 is again clamped against the intermediate 13 the end of the rod 41 is pushed within the hole 20 and the air supply is automatically restored.

[0033] This automatic opening and closing system of the valve 22 requires use of a clever device if it is desired to use the jaw 14 for clamping conventional intermediates or punches not requiring intermediates. Indeed, in this case it is necessary to avoid operation of the valve by these tools. This can be secured by providing a projection 42 near the seal 26 and a corresponding recess (step 43 of FIG 8a) in the intermediate with channel. This

device has the effect of allowing operation of the valve by the intermediates in accordance with the present invention and of preventing operation when conventional intermediates or punches not requiring intermediates are used. Indeed, in the latter case as illustrated in FIGS 9 and 9a the projection 42 prevents operation of the valve by the tool on which the jaw 14 is clamped and this way the valve is always in closed position.

[0034] Naturally numerous modifications, adaptations, variants and replacements of members with others functionally equivalent can be made to the embodiments described above by way of example without going beyond the scope of the claims set forth below.

[0035] Said variants could concern for example the groove 21 which could be replaced or accompanied by a similar groove located on the intermediate 13 and at the level of the hole 19. In addition this groove could be missing if lateral traversing is not provided for the intermediates.

[0036] Other variants could concern the cutoff valve as regards its structural features and its position not necessarily near the hole 20 or in the intermediate clamping jaw. This possibility of different position is valid in particular for the manually operated valve with independent feed of each jaw.

Claims

1. Pneumatic control system for quick clamping of tools in a cornice brake in which there are rows of punches and dies and modular units consisting of intermediates, jaws for clamping the intermediates and jaws for clamping punches, with the latter being operated by actuators driven by pneumatic cylinders, **characterized in that:**

- a) in the intermediates and the jaws clamping the intermediates to the cursor of the press there are channels for feeding of the fluid under pressure to the actuator cylinder;
- b) said channels lead to at least one hole opening onto the opposing surfaces of each pair of intermediates and associated clamping jaw;
- c) on at least one of the two opposing surfaces of each pair of intermediates and associated clamping jaw the associated hole opens onto a groove running horizontally in the surface and positioned at the same level as the hole opening onto the opposing surface; and
- d) in the circuit for supplying the fluid under pressure to every intermediate a valve is inserted designed to intercept the flow of fluid towards the intermediate.

2. Pneumatic control system for quick clamping of tools in a cornice brake in which there are rows of punches and dies and modular units consisting of

intermediates, jaws for clamping the intermediates and jaws for clamping punches, with the latter being operated by actuators driven by pneumatic cylinders, **characterized in that:**

- a) in the intermediates and the jaws clamping the intermediates to the cursor of the press there are channels for feeding of the fluid under pressure to the actuator cylinder;
 - b) said channels lead to two holes mutually opposed opening onto the opposing surfaces of each pair of intermediates and associated clamping jaw; and
 - c) in the supply circuit for fluid under pressure toward each intermediate is inserted a valve designed to intercept the flow of fluid towards the intermediate.
3. System in accordance with claim 1 **characterized in that** the above mentioned groove running horizontally is surrounded by a second groove in which a seal of elastic material is seated, designed to ensure seal of the fluid under pressure when the intermediate and associated clamping jaw are clamped together.
4. System in accordance with claim 1 or 2 **characterized in that** the above mentioned valve is manually operated.
5. System in accordance with claim 1 or 2 **characterized in that** the above mentioned valve is operated automatically and is put in closing or opening condition when the jaw in which it is located is clamped to or respectively is shifted from the associated intermediate.
6. System in accordance with claim 5 **characterized in that** in each intermediate clamping jaw there is a projection on the surface designed to close against the intermediate, designed to be inserted upon clamping in a corresponding recess on the opposing surface of the intermediate so as to prevent opening of the above mentioned valve when the jaw is clamped against tools not having the above mentioned recess.

5

10

15

20

25

30

35

40

45

50

55

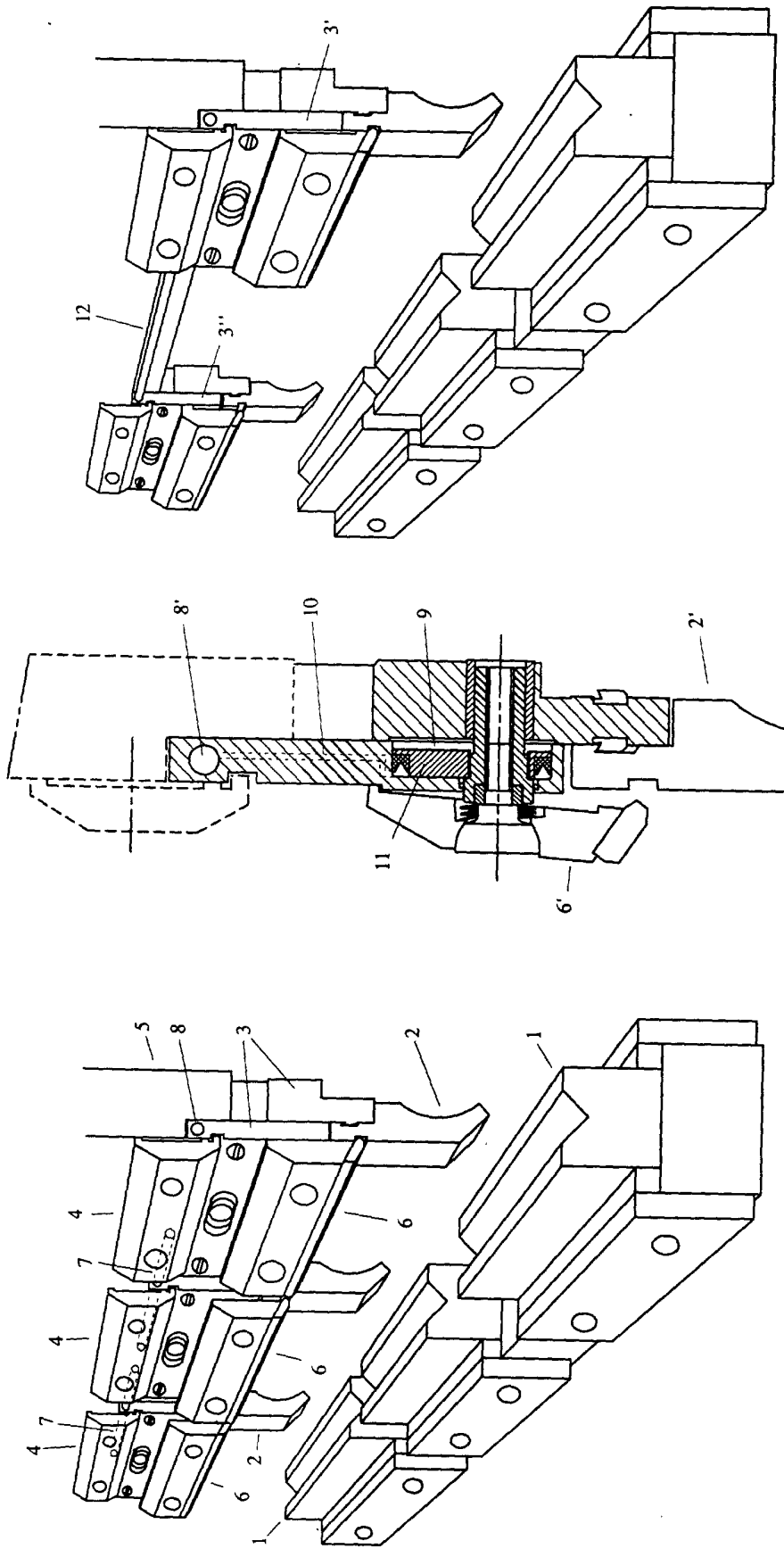


Fig.1

Fig.2

Fig.3

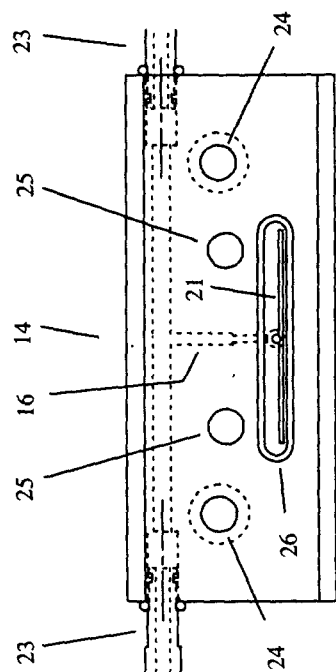


Fig. 5

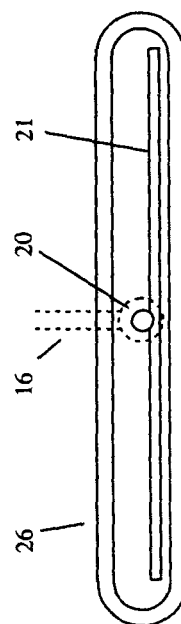


Fig. 5a

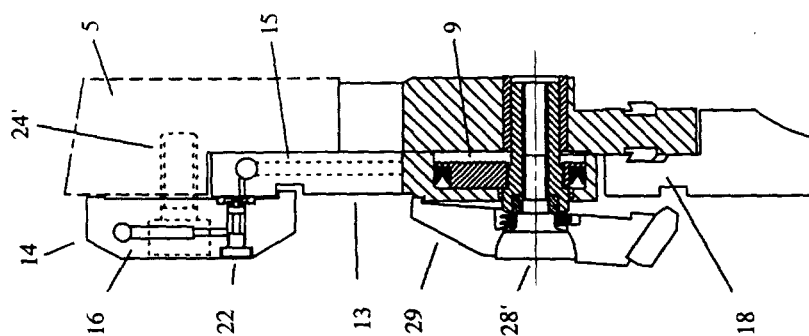


Fig. 4

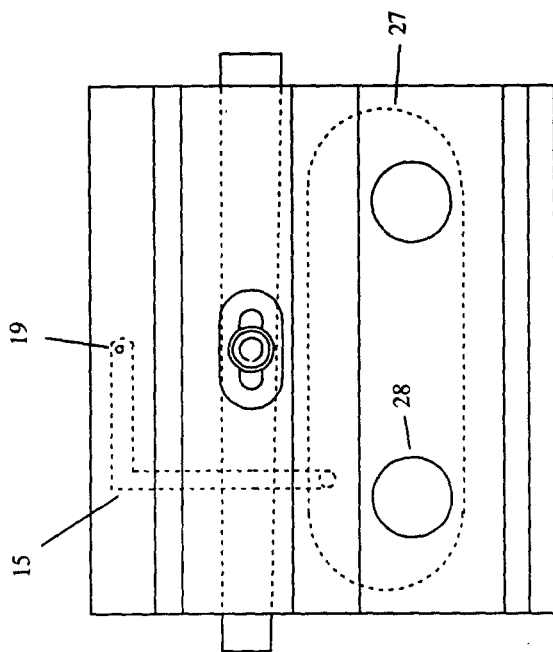


Fig. 6

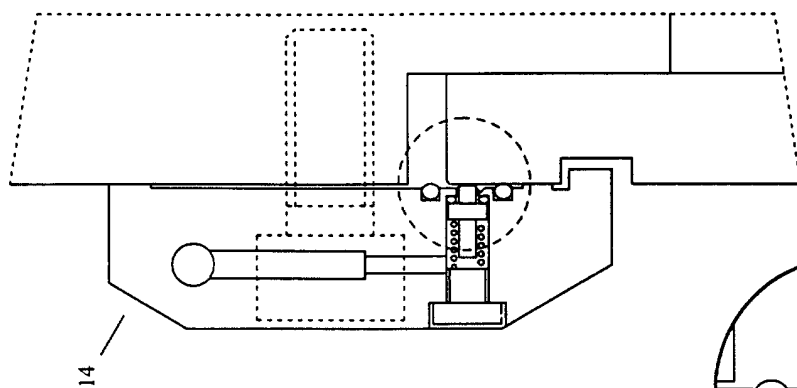


Fig. 9

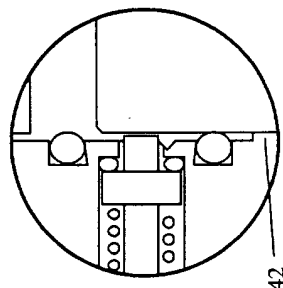


Fig. 9a

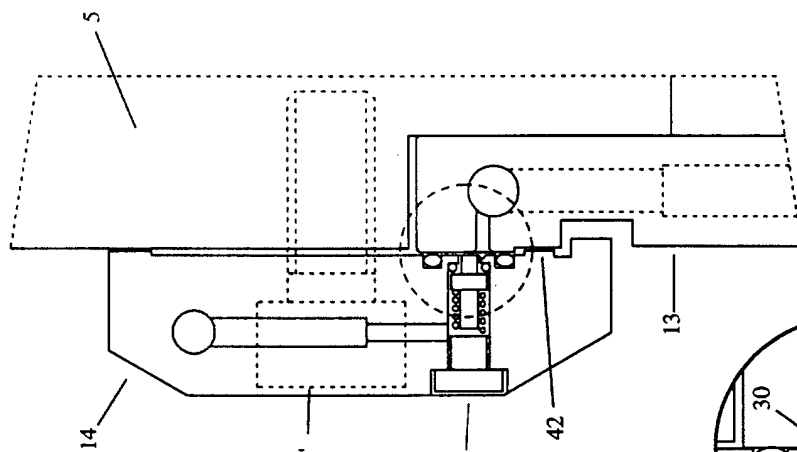


Fig. 8

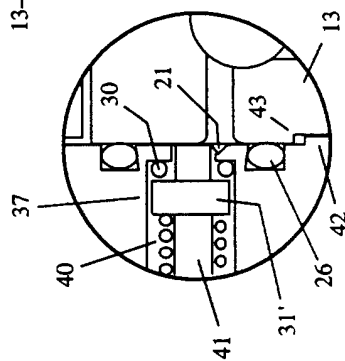


Fig. 8a

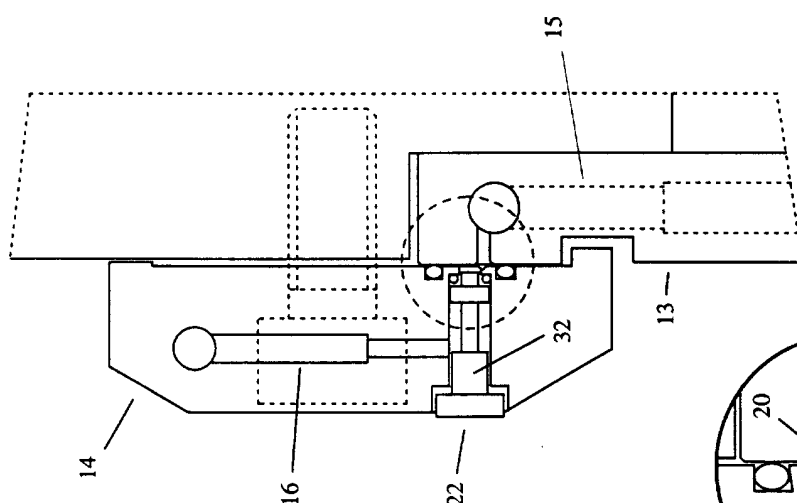


Fig. 7

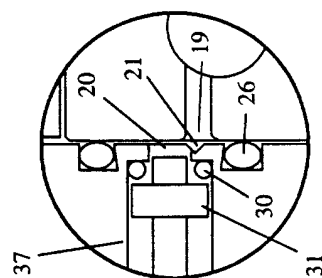


Fig. 7a