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(54) **Improvements to riveting machines.**

(57) This machine is used to punch and then rivet two adjacent plates, being provided with a C-shaped bedplate (1) whose upper arm has the punching head (2) and a rivet holder cylinder (3), coupled to a slide (10) that can travel horizontally. The goffering roll (7) projects from the lower branch thereof, its end being provided with an anvil (8). An automatic rivet selector device is used for sequential insertion of the rivets in a clip (27) that is coaxial with the rivet holder cylinder (3) to be subsequently inserted after the actuation of a sealant applicator device (74) to ensure that the rivet is sealed. The horizontal slide (10) travels along a plane above that of a fixed bridge (15) provided with a weight element (16) fitted with a buffer device (91-95) which provides a certain flexibility upon riveting. The rivet holder cylinder (3) is fitted with a pneumatic device and a hydraulic device for the vertical advancement thereof, for insertion of the rivet in the bore made and hydraulic drive during the actuation of the goffering roll (7). The weight (16) is buffered by means of a pair of pneumatic cylinders (95) which moreover renders the same retractile.

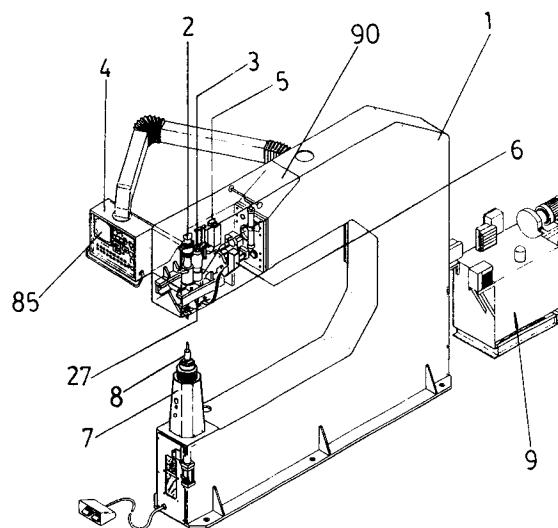


FIG. 1

OBJECT OF THE INVENTION

The present invention relates, as set out in the heading to this specification, to improvements to riveting machines, wherein two adjacent plates are punched and the rivet is inserted and clinched, the above to be carried out manually or automatically from a mobile control panel.

The plates to be riveted to each other must be placed on an anvil and held firmly whilst being punched and riveted, a sealant applicator device also being provided to ensure that the rivet is sealed.

The invention can be especially applied to the building of aircraft, wherein the duraluminium plates must be joined in a very precise and imperious manner.

The following could be said to be the primary objectives that the invention seeks to attain:

- To improve the performance of the various devices that are used in a known manner in this kind of machines, for the automatic or semi-automatic process to be rendered highly accurate and reliable in order for the following stages: bores machining, rivets insertion, sealant application and clinching or riveting to take place in solid devices that are not easy to damage, which would lead the whole process to come to a standstill.
- To conduct manual or automated operations from a mobile control panel, with a TV circuit whose screen is located at the control panel.
- To include these built-in devices in a robust C-shaped bedplate supporting the clinching pressure, and constantly holding both plates to be riveted to each other.
- A greater operativity and optimised performance upon riveting or clinching the rivet, including a buffer device in the elements which together hold the plates or sheets, which thus take up a floating position thereafter.
- To render the upper plate weight retractable in order to avoid unnecessary wear when the plates are displaced for the next bore to be punched and a new rivet to be placed.

BACKGROUND OF THE INVENTION

There currently exist riveting machines with a different functionality and different structures that depend upon the strength afforded by the elements to be riveted to each other, and the actual nature of the latter, functions being clearly automated in some cases and in others a single operation being effected, other machines or ancillary devices being required. Thus, Spanish Utility Model 94,381 relates to a machine comprising two bodies joined by

a central bolt that becomes rotatory when the riveter is to be changed, operation being continuous upon stepping on a pedal. Spanish Utility Model no. 157,995 relates to an oscillating riveting machine where the riveting means have a circular pendular movement, for the cone generated by the implement's shaft to be inverted, at the same time receiving an axial thrust for the clinch at the rivet set to be deformed. The means are housed in the mobile part of a swivel joint that is duly positioned by means of a spring.

Reference can also be made to the pneumatic machine placing flat rivets with widths of different sizes, as set out in Spanish Utility Model 164,147 and comprising a base or support extending into an arm the end of which is provided with an adjusting screw at the height of the anvil bracket that is in turn laterally fixed by a screw, a duct-guide defining a feeding device with its mouth flush with the riveting hammer, which hammer is joined to the pneumatic piston.

Spanish Utility Model 182,485 sets forth an improved device for punching material and placing rivets and the like, having equipment to classify eyelets and the like and a duct through which such elements reach the placement means therefor. It comprises a chisel mouth or interchangeable dies, and at the working base there is an element for placing the various guides. It is also provided with holes to centre the nozzles for the lateral guides, and a hand pin to place the various ducts forming the classifier and the duct through which the rivet elements drop. Actuation is achieved by means of a pedal and through a rod that causes the nozzle holder shaft to move up or down, a roller also being involved pressing against the said chisel and shaft.

Spanish Utility Model 272,229 claims a riveter whose bedplate, bearing column and riveting head as such are interchangeable independent and autonomous modules, the head having its own drive motor to rotate the rivet set, causing the rivet snap to rotate and travel axially.

Reference shall also be made, as background to the invention, to the results obtained in the research conducted with the International Patent Institute of The Hague, to establish the degree of international novelty, particularly relevant therein being European Patent no. 0402222 which describes a machine that is functionally similar to the machine subject hereof in so far as the logical process of placing rivets automatically is concerned, but basically relying upon two independent robotic arms which are provided with two frames that are held still by means of locking devices at an initial relative position and wherein the displacements are achieved with pneumatic jacks. The advancement of the punching implement is effected

horizontally, whereas the plates to be joined are disposed vertically. The punching tool is positioned in order for the bore to be made by rotation of a bearing arm activated by a pneumatic motor. The sealant product is poured through a stiff conduit and a hopper, travelling by means of two jacks that act at right angles to each other. The rivets access through a conventional device to face the hole in the plates and are inserted by means of a rivet snap that can only move linearly. Riveting is obtained by displacing a reaction pin activated by a simple jack.

In the research conducted, Patents of Invention cited were US no. 4955119, FR no. 821700, US no. 2063691 and US no. 3030832, of lesser significance to the extent that they are not closely related to the object of the present invention. Thus, in US Patent no. 4955119 which relates to an automatic fixing apparatus, with an accessory for the mobile operating head of a robot, two heads with implements in line and located on either side of the plates to be joined are activated and work in series in order to hold the plates, insert a rivet and proceed with clinching.

French Patent no. 821700 relates to improvements to automatic punching and riveting machines, installing countersunk head rivets and where the plates to be joined stand still, thereby to obtain a rapid manipulation to compress or release the plates. The punching implement comprises a drill joined to a point and the punching implement is used as an element for insertion of the rivets from a feed device next to the drill; due to the extensive travel by the puncher and the speed attained unpleasant jolting ensues when it works at a high speed, the use of an additional thruster to insert rivets which remains upon the rivet during the formation of its head is also provided, thereby for the plates to be duly held upon making the bore and placing the rivet.

US Patent 2063691 improves a combined punching-riveting machine, with a rotatory positioning device, the plates being strung, once they are punched, by a lower implement that shall subsequently be retractable upon insertion of the rivet and acting as a dolly. Finally, US Patent no. 3030832 refers to a riveting machine in which the thickness of the materials to be riveted to each other is automatically detected, the length of the rivets being selected and the latter being transported to the rivet-holder device.

DESCRIPTION OF THE INVENTION

The riveting machine to which the improvements subject hereof are applied comprises a robust C-shaped bedplate whose upper arm is provided with a punching head and a rivet holder

cylinder. The other bedplate arm has the anvil standing on a goffering roll. The two plates or sheets to be coupled are held firmly between the anvil and an element that we shall refer to as a weight, attached to a bridge-like fixed support.

The machine also has an automatic rivet selector device comprising a hopper containing the bulk rivets and a chute through which they are led to a rivet holder clip coaxial with the rivet holder cylinder.

Both the punching head and the rivet holder cylinder are disposed on a pneumatically operated horizontal slide, so that upon operation of the latter the plates can first of all be punched and the rivet then placed and clinched, which operations are effected with both the weight's arms pressing against the plates to be punched, due to the thrust exerted by the anvil located under the plates to be coupled.

There is also an applicator for a sealant that guarantees the sealing of the rivet in respect of the holes of the plates it traverses, inasmuch as the invention is particularly useful for joining aircraft bodywork plates, which must needs be extremely meticulous and accurate.

The control panel is preferably coupled to a device comprising a mobile arm in order for the operation to be conducted both manually and automatically, from wherever it is necessary.

The device feeding the rivets also comprises an intermittent blower nozzle that prevents accumulation at the outlet mouth of the hopper of rivets that are not duly oriented and that already take up a space provided to such end, from which they are to be led one by one and as required by the rivet holder clip, before the same moves to the position that coincides precisely with the bore that has just been punched.

When inserting the rivet, the arms making up the clip open to allow release of its head and for it to be tightly fitted against the upper plate in the assembly to be joined. The rivet holder cylinder presses against the head to resist activation of the goffering roll that rises hydraulically to cause clinching or riveting.

Upon riveting, the rivet is on the one hand operated by the rivet holder rod and on the other by the anvil as such of the goffering roll. In order to prevent the plates from an undue stress, to the extent that they rest upon the upper weight, the latter element is provided to be joined to the upper branch of the C-shaped bedplate, or crossrail, by means of the buffer device which is advantageously defined by a pair of pneumatic cylinders provided on the sides. These cylinders are moreover useful in order that after riveting the weight can be raised to expedite displacement of the parts or plates for a new bore to be made and another rivet

be placed.

Given that the plates or parts to be joined must be pressed strongly throughout the rivet placement process and since the through bore is made, a robust structure guides this vertical displacement.

Let us recall that the goffering roll projects vertically from the lower bedplate with the anvil resting at its free end, the plates or parts to be joined in turn resting upon the anvil. The anvil is made up by an external casing that defines the element which is actually weighted upon the lower plate, upon actuation of the pneumatic device with which it is fitted, holding the plates firmly against the arms of the weights in the crossrail, maintained in a pneumatically assisted position. The parts are therefore in a floating position, albeit held with the necessary mutual pressure for an adequate simultaneous boring and the ultimate insertion of the rivet and clinching.

In order to contribute to the understanding of the characteristics of the invention sheets of drawings are attached to the specification as an integral part thereof which, while purely illustrative and not fully comprehensive, show the following:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1.- Is a perspective view of the riveting machine which includes the improvements subject of the invention.

Figure 2.- Is a partial longitudinal elevation cut-away view of the upper branch of the C-shaped bedplate of the riveting machine of figure 1.

Figure 3.- Is a section along line A-A of figure 2.

Figure 4.- Is a section along line B-B of figure 2.

Figure 5.- Is a longitudinal elevation view, with a face cut away, of the rivet holder cylinder.

Figure 6.- Is an elevation view, with a face cut away, of the rivet holder clip.

Figure 7.- Is an elevation view, with a face cut away, of the anvil assembly.

Figure 8.- Is an elevation view, with a face cut away, of the goffering roll.

Figure 9.- Is a perspective view of the automatic rivet selector.

Figure 10.- Is an elevation view, with a face cut away, of the sealant applicator device.

Figure 11.- Is a diagram of the riveting sequence.

Figure 12.- Is a partial view, as in figure 3, with the upper weight fitted with a buffer device, as a further improvement of the invention.

Figure 13.- Is a section along line C-C of figure 12.

Figure 14.- Is a side elevation cut-away view of the contents of figure 13.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the numbering used in the figures, we can see that the riveting machine provided with the inventions subject of the invention comprises a robust C-shaped bedplate 1 with the two plates to be punched and subsequently riveted to each other located between the arms thereof. The upper arm, as is clearly shown in the perspective view of figure 1, contains the punching head numbered 2 and the rivet holder cylinder numbered 3. We can also see the control panel 4 and the lighting equipment 5. One of the sides of such upper bedplate 1 arm is fitted with the automatic rivet selector, generally numbered 6.

The lower bedplate 1 branch is coupled with the goffering roll 7, projecting vertically from its end to hold the anvil 8.

Generally numbered as 9 is the electro-hydro-pneumatic station.

Figure 2 shows that the punching head 2, and the rivet holder cylinder 3, are coupled to a slide 10 travelling horizontally and longitudinally along the crossrail 11, which displacement is achieved by activating the cylinder 12 connected through an elastic coupling 13.

The lower part of the crossrail 11 is fitted with the supports 14 between which lies the bridge 15 holding the weight 16 element, which causes the plates to be joined to be stabilised and held firmly during punching and riveting, because of the pressure exerted from below by the goffering roll, as we shall see hereinafter.

The rivet holder cylinder 3, whose structure is more clearly appreciated in figures 4 and 5, is activated hydraulically and fastened to the slide 10 through its lower part. Its upper part has the half-shaft 17 that is connected to a pneumatic activation device, actually comprising the pneumatic cylinder 18 which provides rapid forward movement, prior to activation of the hydraulic cylinder. The pneumatic cylinder 18 is attached to the non-rotation clamp 19, which is secured to the upper head 20 of the hydraulic piston cylinder 21, preventing rotation with the rod 22 that slides in the bushing 23 adjusted to the clamp 19. The ends of the upper half-shaft 17, non-rotation rod 22 and pneumatic cylinder rod 19 are secured to the separator plate 24, as shown in figure 5.

The lower half-shaft 25 of the rivet holder cylinder 3 is coaxially provided at its lower end with the blind hole 26 connecting the rivet holder clip, generally numbered 27, its structure being shown in figure 6. This figure shows the support 28 where the blind hole 26 of the lower half-shaft 25 of the rivet holder cylinder 3 is to be provided; the rivet holder rod 29 connected to the aforesaid through

the Allen screw 30; and the helical spring 31 driving the clamp 32, together with the clip as such. The clamp 32 is provided with the annularly disposed spring 34. Numbers 35 and 36 refer to respective holdfasts to prevent the clip from rotating, and separation of the elements making up the assembly. The rivets arrive through one of the sides of the clip in order to take up a coaxial position, coming in through the side window 37. With this layout, the arms making up the clip 33 can open to allow insertion of the rivet, that hangs from its lower end and that is held from its head. After riveting, the arms making up the clip 33 recover their original position by action of the spring 29 pressing against the washer 38.

As we saw originally, the plates to be joined are positioned between the weight 16 in the upper bridge 15 and the upper end of the anvil 8 stiffened to the goffering roll 7. Figure 7 shows the structure of the anvil 8 assembly, comprising the external casing 39 that we shall refer to as the plate weight, for this element initially presses directly upon the plates to be riveted, holding them firmly against the arms of the weight 16 in the crossrail 11; the anvil 40 as such to be driven by the thruster 41 upon actuation of the goffering roll 7; the anvil support 42 to be attached by means of the holdfasts 43 to the base plate 44; and the cross pin 45 to be activated by the thruster 41 for the plate weight 39 to move upwards to duly execute its function. When the elements are held firmly and in due time, as we shall see hereinafter, the anvil support 42 is the element that rises upon activating the goffering roll, in order for the rivet to be clinched, such movement being allowed by the wide hole 46 in the anvil support 42, as may be easily inferred from figure 7.

Figure 8 shows the goffering roll with its upper end fitted with the anvil assembly 8, shown with the dotted and dash lines.

The main elements in the structure thereof are the piston 47, the half-shafts 48 and 49, the sleeve 50 and the anvil support 51. The hydraulic pressure is transmitted to the forward and rear chambers of the piston 47 through the connectors 51 and 52 respectively coupled to the upper 53 and lower 54 heads. Fast displacement of the plates weight 39 from the anvil 8 assembly is achieved by activating the pneumatic cylinder 55 just before activating the hydraulic equipment with which the anvil support 42 is provided.

With reference to figure 9 which shows a perspective of the automatic rivets selector, generally referred to as number 6, we can see that it basically comprises a hopper 56 containing the rivets, its base having a blower device that prevents their accumulating at the outlet mouth where there is a wide hole 57 through which the rivet bodies pass,

therefore taking up a generally vertical position, held from their head. The rivets can thus move forward by gravity, between the close edges of the coplanar rods 58. The rivets blower device is intermittent and therefore when it stops at least one of them can easily take up the correct position to gradually accumulate at the first sector 59 of the chute 60, preferably in line. The pneumatic device that the cylinder 61 forms a part of allows a single rivet to fall down the chute 60 towards the launcher assembly that is generally referred to as 62, this being the element in charge of inserting the rivet into the rivet holder cylinder 3 clip 27, whenever appropriate, to which reference shall be made in connection with figure 11, which shows the sequence of movements.

The launcher assembly 62 comprises the launcher as such, referred to as 63, and provided with a pneumatic cylinder 64, this assembly being fixed to the support 65.

With this layout and in view of figure 11, we can see the sequence of movements or operative stages of the riveting machine subject hereof. Position "a" shows the machine ready for punching of the elements 66 that are to be riveted, such leaning against the weight 16, the anvil 8 being at a distance from such elements 66.

Then a simultaneous movement takes place where the anvil is raised to hold the elements 66 firmly and the punching head 2 is lowered to make the bore for the rivet, as shown in position "b", the rivet 67 also entering the clip 33 as such in the rivet holder cylinder 3 clip assembly.

Upon punching, the head 2 rises and the slide 10 is then displaced horizontally, whereupon the rivet holder clip 27 takes the place of the head 2, as shown in position "c" of this figure 11.

The rivet holder cylinder 3 moves down to insert the rivet 67 in the hole made in the previous operation, as shown in position "d".

Position "e" shows the last riveting sequence, in which the goffering roll rises due to the hydraulic pressure exerted upon the same, in order to clinch the rivet 67, which operation can take place since the rivet holder rod 29 (see figure 6) moves down upon hydraulic displacement of the piston 21 in the rivet holder cylinder 3, bearing the pressure exerted by the goffering roll 7. In positions "b" and "e" the arms defining the clip 33, between which is the rivet to be inserted, are open since the rivet holder rod 29 has moved downwards, overcoming the recoil spring 31 action.

While the rivet is being inserted and clinched, a new rivet reaches the launcher and is disposed to be placed on the rivet holding clip 27, which takes place while a new punching operation is effected (as shown in position "b").

In the various positions of figure 11, corre-

sponding to the riveting sequence, we can see that the lower chamber in the pneumatic cylinder 55 (see figure 8) is numbered 68 and the pneumatic pressure on the piston is transmitted through the shaft 69 (see figure 8) to the thruster 41 in the anvil 8. We can also see that the lower chamber in the hydraulic cylinder causing goffering, below the piston 47 (see figure 8) is numbered (70). The pneumatic chamber 68 and the hydraulic chamber 70 vary in size as indicated in the various positions of the working cycle.

Going back to figure 10, we can see the structure of the sealant applicator device, which ensures total sealing of the rivet in its housing as defined by the hole through both plates or sheets to be joined. Such comprises a vertical shaft 71 that is displaced duly guided in a bushing 72 that adjusts in a hole in the bridge 15 of the crossrail 11. Radially connected to the lower end of the rod or shaft 71 is the arm 73 fitted with the sealant applicator 74 at its free end.

The shaft 71 is axially displaceable since its upper end is connected to the pneumatic cylinder 75 and through a support 76, this movement being further provided by a helical spring 77.

In addition to this axial displacement of the rod 71, the radial arm 73 is also angularly displaced, this being achieved because of the bearing 78 and the clamping assembly 79. The pin 80 that is held firmly and fixed at the nut 81 and the groove 82 provided on the external periphery of the rod 71, acting as a cam, upon displacement of the said rod 71, causes the same to rotate in order for the applicator 74 to rotate and move down to execute its function, when appropriate, just after punching and before the rivet 67 is inserted.

Going back to figures 2 and 3, it is clear that the invention also provides a device for blowing the shavings formed upon punching. Such device comprises a tube 83 with its nozzle oriented between the weight's arms 16.

These same figures 2 and 3 also show the device that holds the TV camera 84 for monitoring punching and riveting on the control panel 4 screen 85 (see figure 1). The assembly holding an optical cylinder is numbered 86 in figure 3.

It should also be noted that the cylindrical casing defined by the anvil 8 plate weight has a wide lateral notch 87, as shown in figure 7, in order to eliminate the shavings that could drop through the hole made upon punching and that would be on the rod 40 or anvil as such.

Numbered 88 in figure 2 is the pneumatic cylinder holding the fork 89 connected to the bed-plate 1 framework cover 90 to lift the same and allow access to the inside thereof, as also shown in figure 1.

The pneumatic and hydraulic circuits are fitted

with the relevant taring valves, and the ends of travel for the various movements of the machine, for both the cylinders and the slide 10. The slide 10 also has forward and rear buffers to brake the displacements caused by the pneumatic cylinder 12 with which it is fitted, hydraulic deceleration also being provided up to the stopping points defining correct location of the punching and the rivet holder implement.

With reference in particular now to figures 12, 13 and 14, which show a further improvement of the invention, since the rigid upper weight structure is replaced with a buffer device inasmuch as the parts to be joined could disadvantageously remain pressed against the weight 16 upon clinching, when pressure is at its most and pressure need only be applied to the rivet, i.e., the parts or plates are unduly stressed and could even see their surface damaged and be deformed, since the bearing points of the weight 16 are close to the axis upon which the action and reaction forces are applied.

In order to overcome this last drawback mentioned, we can observe that in the said figures 12, 13 and 14 the weight element 16 as such is attached to what we have called the bridge 15 and the latter in turn to the bearing plates 91 which are duly anchored to the vertical bars 92 or columns that can move vertically along the linear bearings 93 fastened to the crossrail 11, or fixed element of the upper C-shaped frame branch.

In this preferred embodiment there are hence four columns or vertical bars 92 guiding this vertical travel of the mobile assembly defined by the elements 16, 15 and 91, coupled to each other.

The bearing plates 91 have their rods 94 connected with a number of pneumatic cylinders 95 attached by their sleeve to the respective bearings 96 anchored to the sides of the crossrail frame 11, just as the bearings 93 and at the mid-point thereof, as is clearly shown in figure 14.

With this layout, the plates to be joined are pressed together by pneumatic thrust, thereby to acquire a floating position which allows a slight variation when developing the maximum output for riveting to take place. When this operation is over, the actuation of the pneumatic cylinders 95 can be commanded in order for the plate weight assembly to be retractable such that the displacement of the plates is not interfered with when seeking the new position and making the new bore and inserting the relevant rivet.

Claims

1. IMPROVEMENTS TO RIVETING MACHINES, of the sort comprising a robust C-shaped bed-plate whose upper branch has the the punching head and the rivet holder cylinder driving

the rivet that is axially borne by a holder clip, inserting the same in the hole made previously and riveting the same with a goffing roll anchored to the lower C-shaped bedplate arm, moreover having a sealant applicator device to ensure that the rivet is sealed, characterised in that the punching head (2) and the rivet holder cylinder (3) is mounted upon a pneumatically driven horizontal slide (10) which travels upon a crossrail (11) located at a level above a fixed bearing disposed as a sort of bridge (15) and to which a weight (16) is coupled defined by two arms borne by the plates to be punched, the punching head (2) travelling vertically inasmuch as it is part of a hydraulic device, whilst the rivet holder cylinder (3) is fitted with an initial pneumatic device and a hydraulic device in order thereby to attain a rapid advancement before actuating the latter.

2. IMPROVEMENTS TO RIVETING MACHINES,

as in claim 1, characterised in that the pneumatic and hydraulic devices that the rivet holder cylinder (3) is provided with are defined by a number of parallel cylinders connected by a clamp (19) coupled to the upper head (20) of the hydraulic piston (21) cylinder and inter-related to a separator plate (24) joining the rods thereof, it being provided that the piston (21) have coupled to its lower half-shaft's free end the rivet holder clip (27) surrounding the rivet holder rod (29) and that comprises two parts (33) that can be angularly displaced and are assisted by a coaxial spring (31).

3. IMPROVEMENTS TO RIVETING MACHINES,

as in claim 1, characterised in that the rivets accessing to the rivet holder clip (27) are contained in bulk in a hopper (56) at the base of which there is a blower device that prevents their accumulating at the outlet mouth where there is a wide hole (57) that allows passage of the rivet body while the head thereof is retained and moves along the edges of two close rods (58), to take up an orderly position in line at the first stretch (59) of a chute (60) where they are held by a pneumatic device that releases the same one by one to the rivet holder clip (27), upon actuation of a launcher (62) driven by a pneumatic cylinder (64).

4. IMPROVEMENTS TO RIVETING MACHINES,

as in claim 1, characterised in that the goffing cylinder (7) is provided, above its piston (47) and connected to the upper half-shaft (48), with an anvil (8) having an external casing (39) that travels pneumatically when driven by a rod (69) that coaxially crosses the assembly

and is connected at the bottom to a pneumatic cylinder, axial pressure being exerted through a thruster (41) upon an anvil bearing (42) with a diametric wide hole (46) wherein plays a transverse pin anchored to the casing (39), a hydraulic thrust being exerted for riveting when the upper half-shaft (48) acts directly upon the anvil bearing (42) capped by the anvil as such (40), the wide hole (46) in the anvil bearing (42) allowing such relative displacement.

5. IMPROVEMENTS TO RIVETING MACHINES,

as in claim 1, characterised in that the sealant applicator includes a pneumatic cylinder (75) anchored to one of the weight bridge (15) branches, activation of which causes displacement and rotation of a vertical rod (71), connected to which is a radial arm (73) holding the sealant applicator (74) at its end, this latter being inserted in the bore made in the plates to be joined.

6. IMPROVEMENTS TO RIVETING MACHINES,

as in claim 1, characterised in that the weight element (16) is coupled to the bridge (15) through a buffer device defined by two pneumatic cylinders (95) anchored to the respective sides of the crossrail (11) of the machine and to which rods (94) are coupled the bearing plates (91) that travel linearly in two pairs of axial bearings (93) likewise fastened to the crossrail (11).

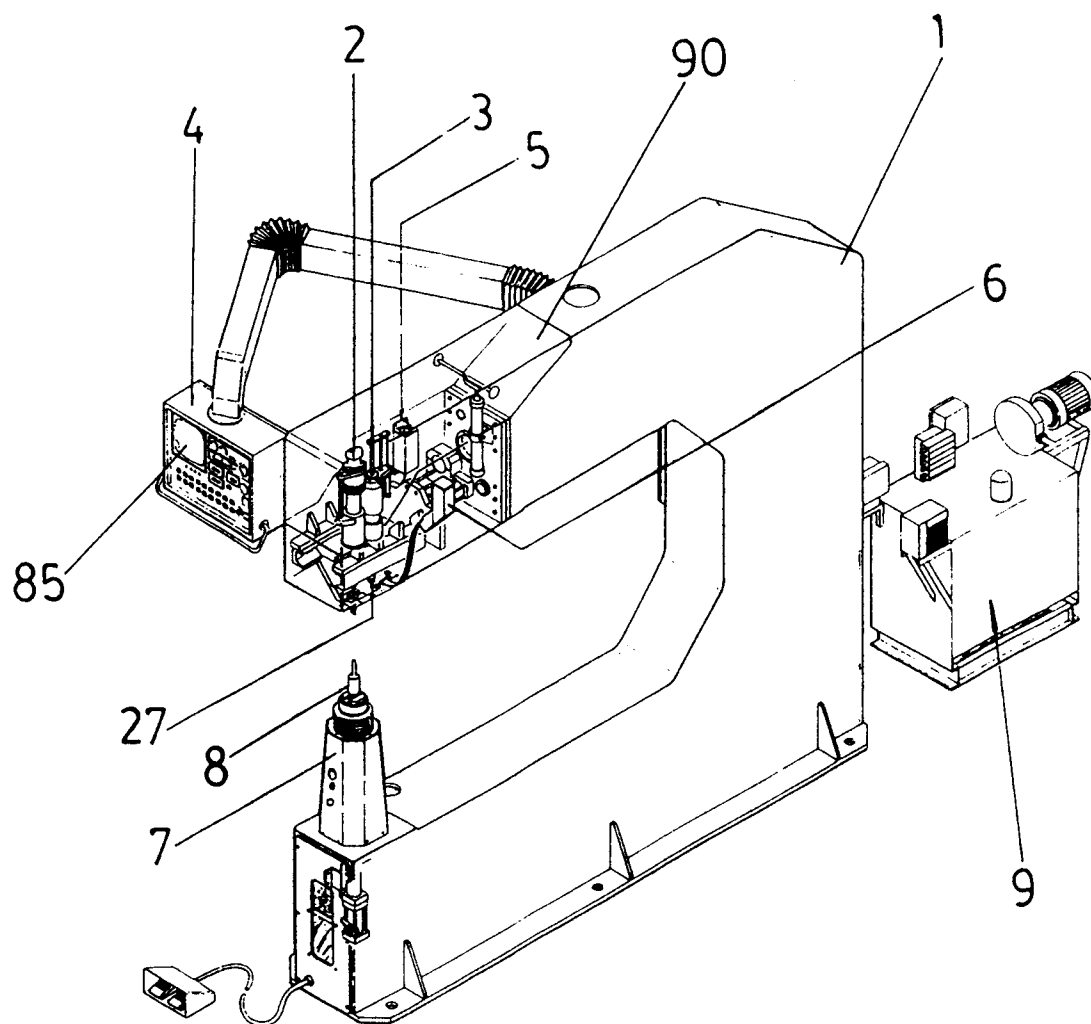


FIG. 1

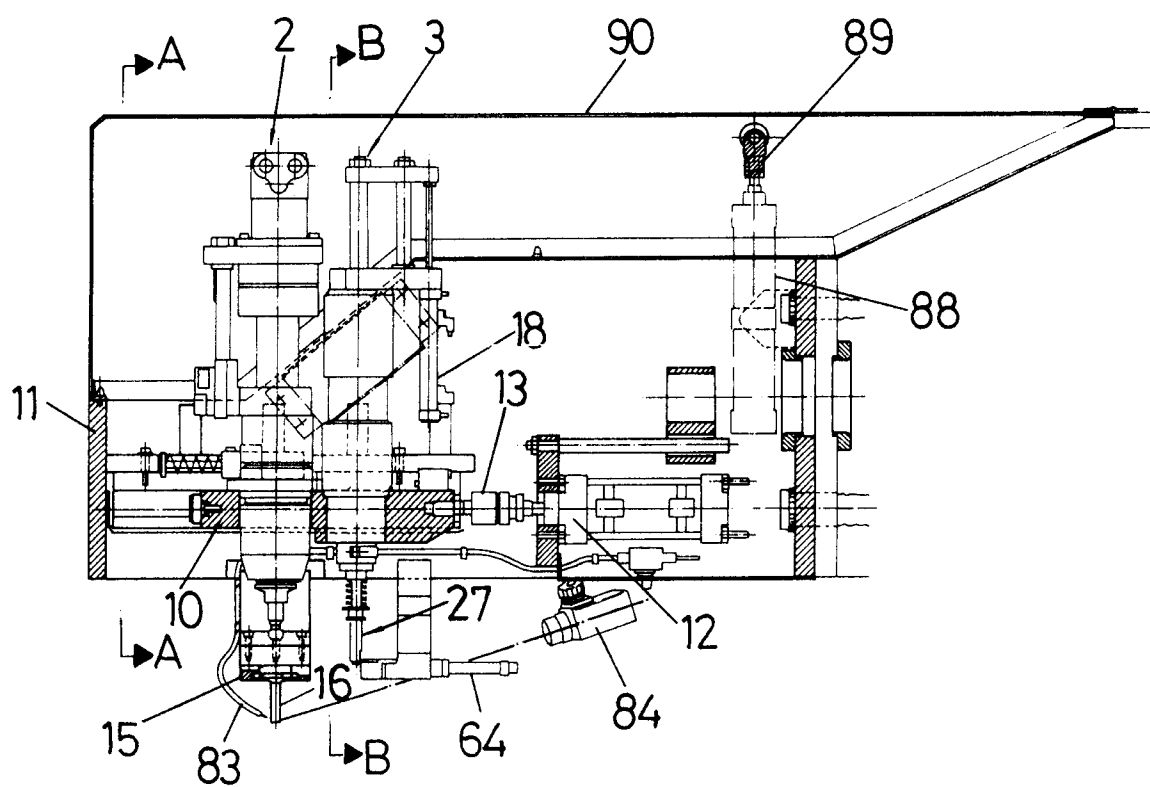


FIG. 2

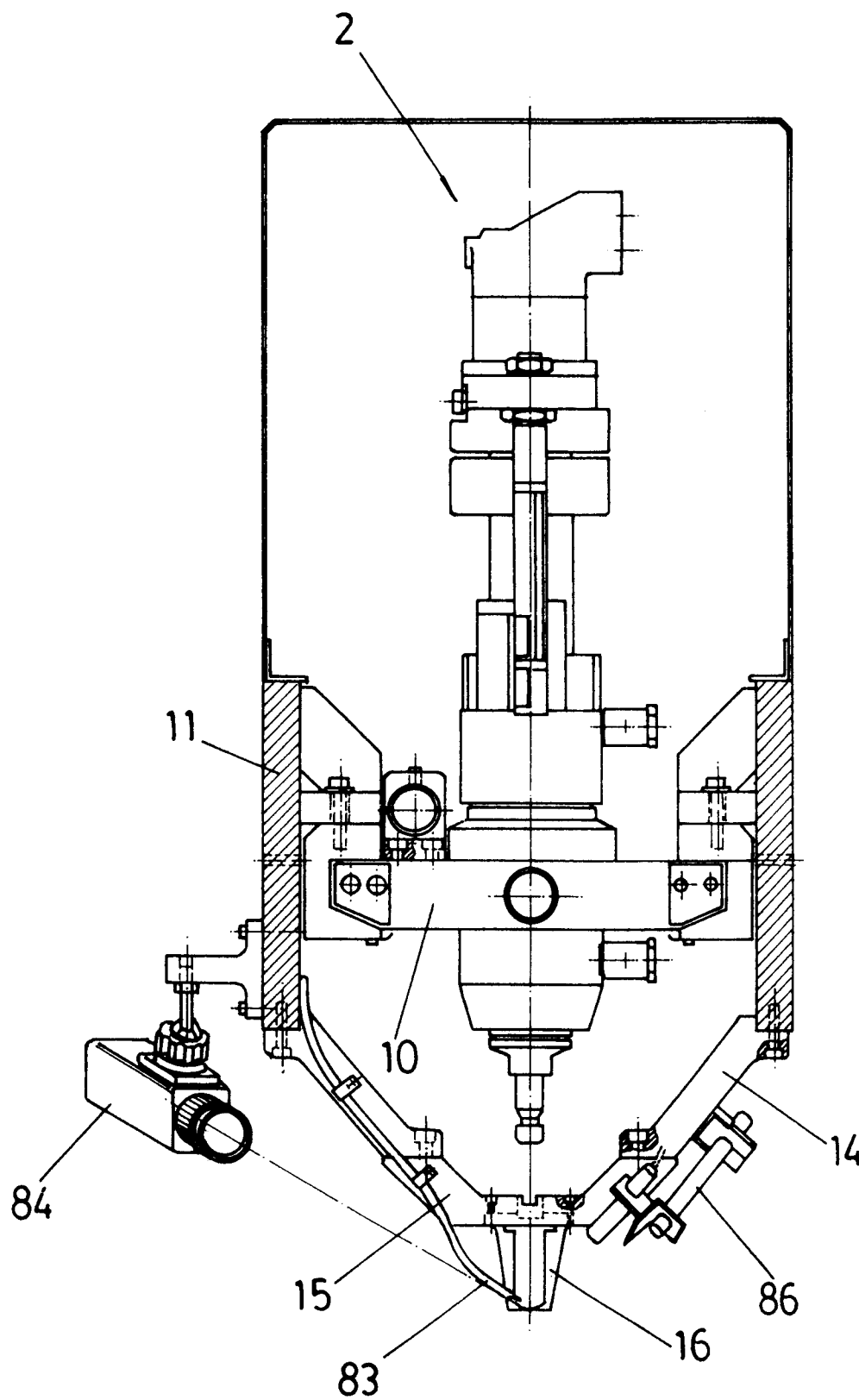


FIG. 3
A-A

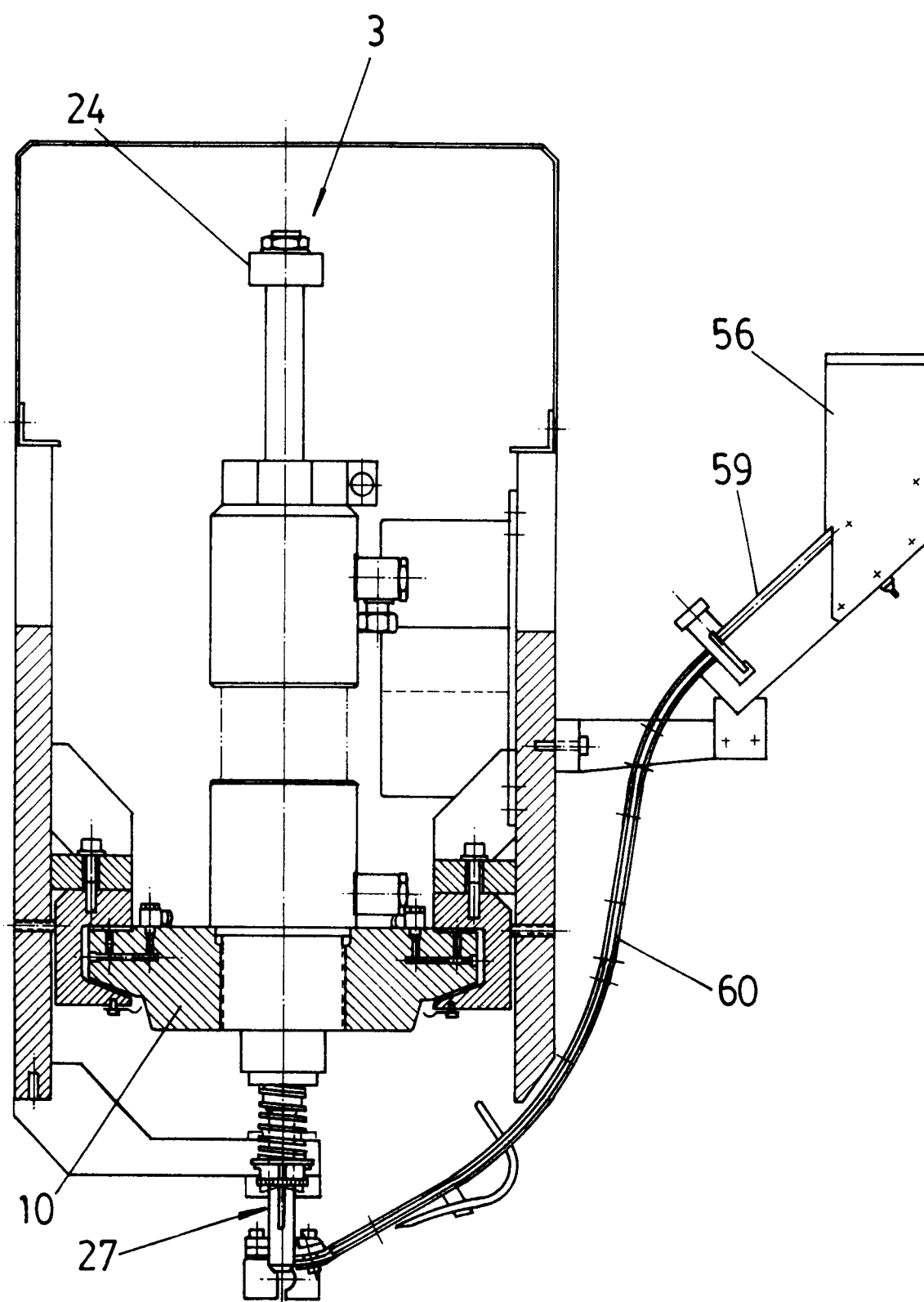


FIG. 4
B-B

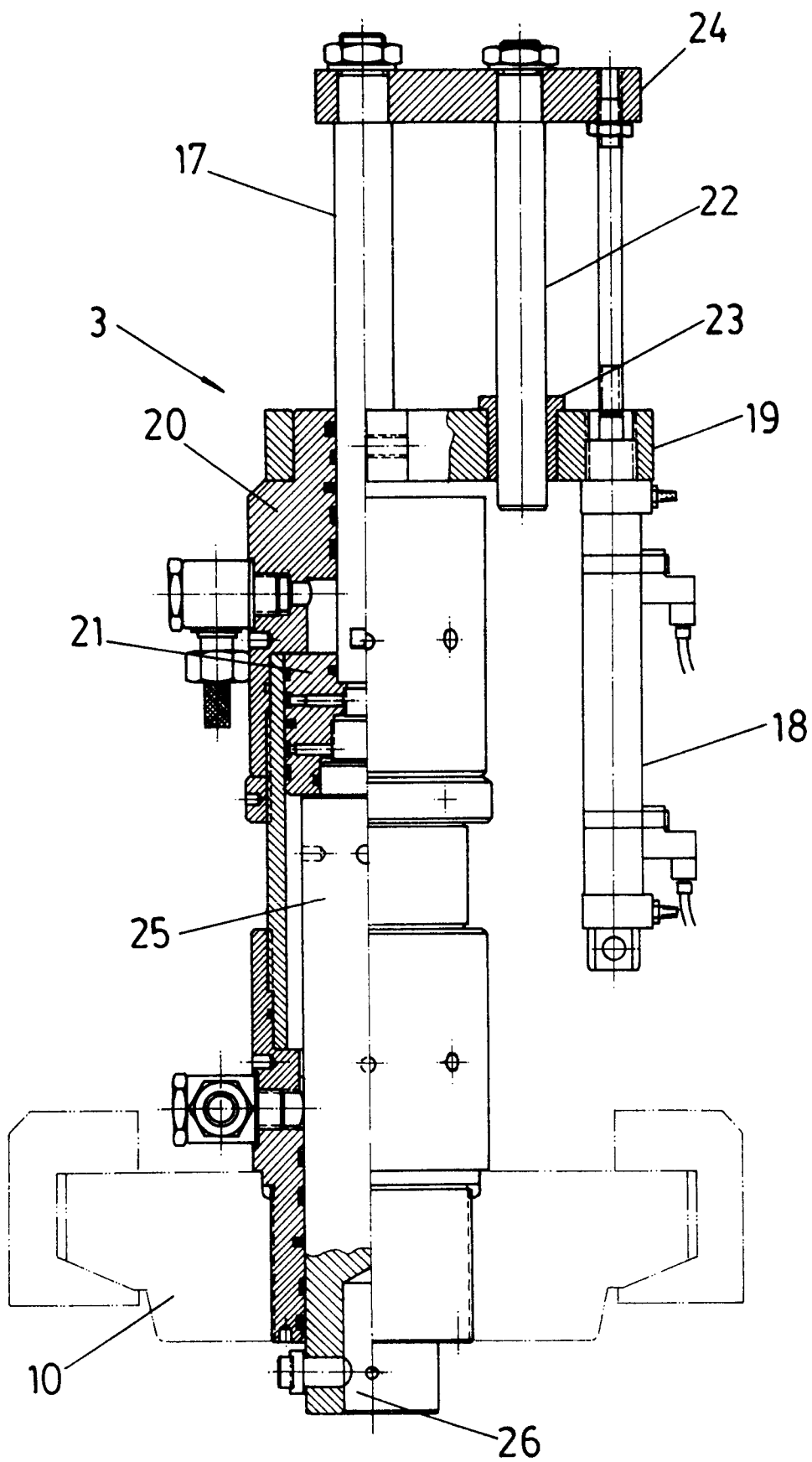


FIG. 5

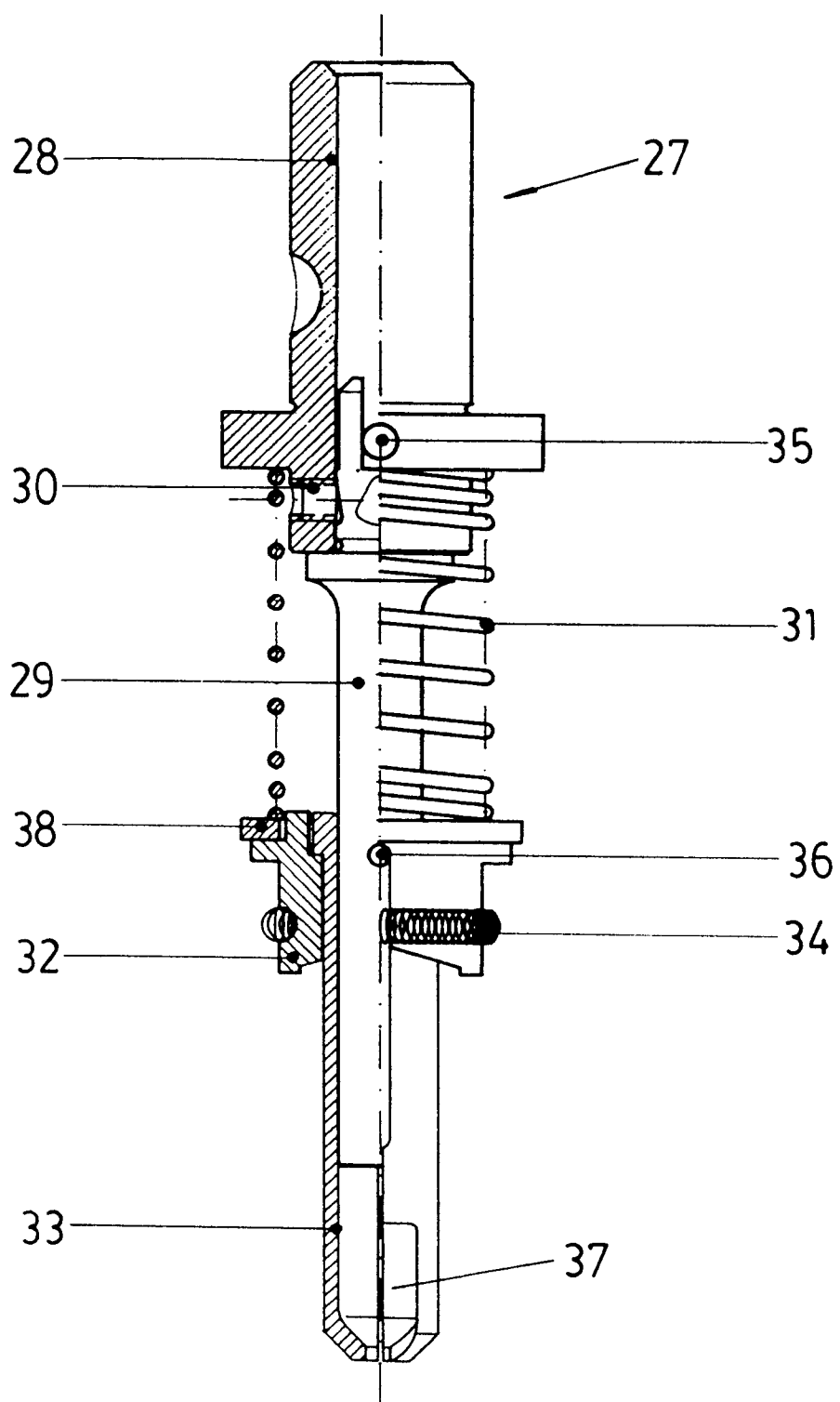


FIG.6

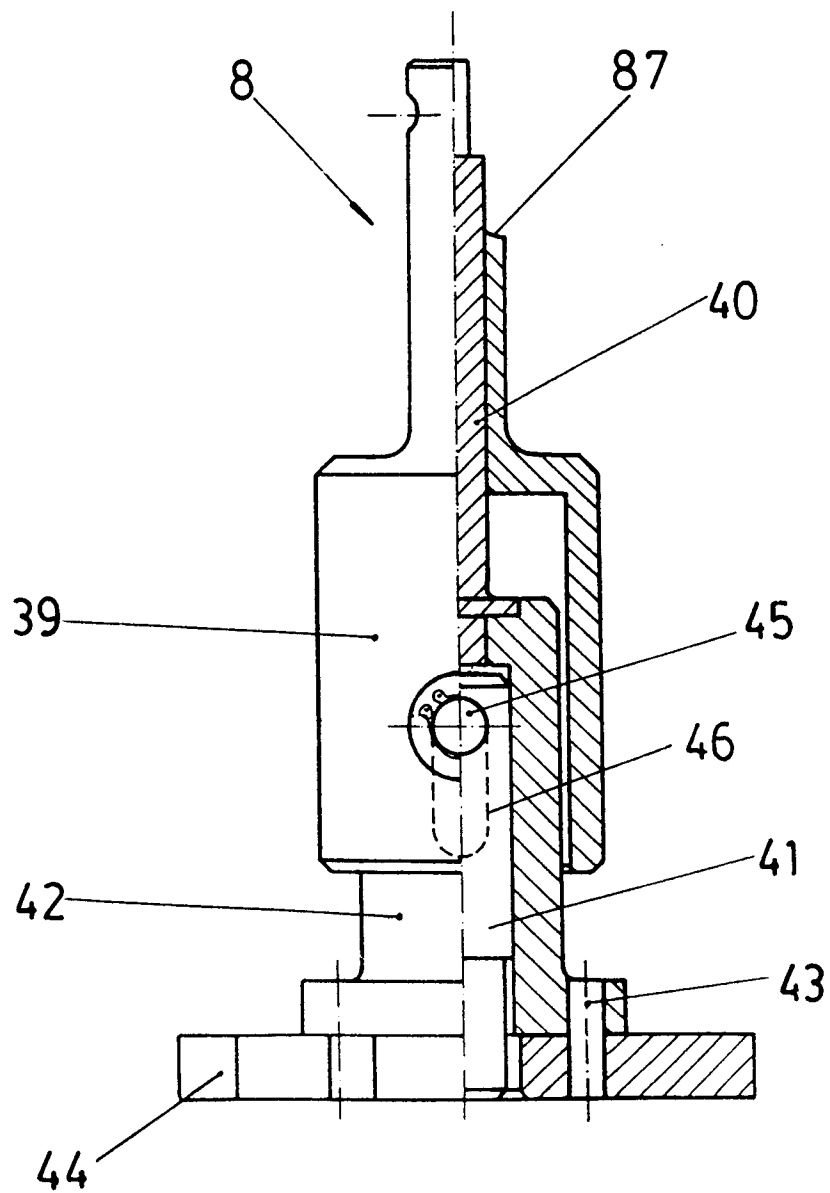


FIG.7

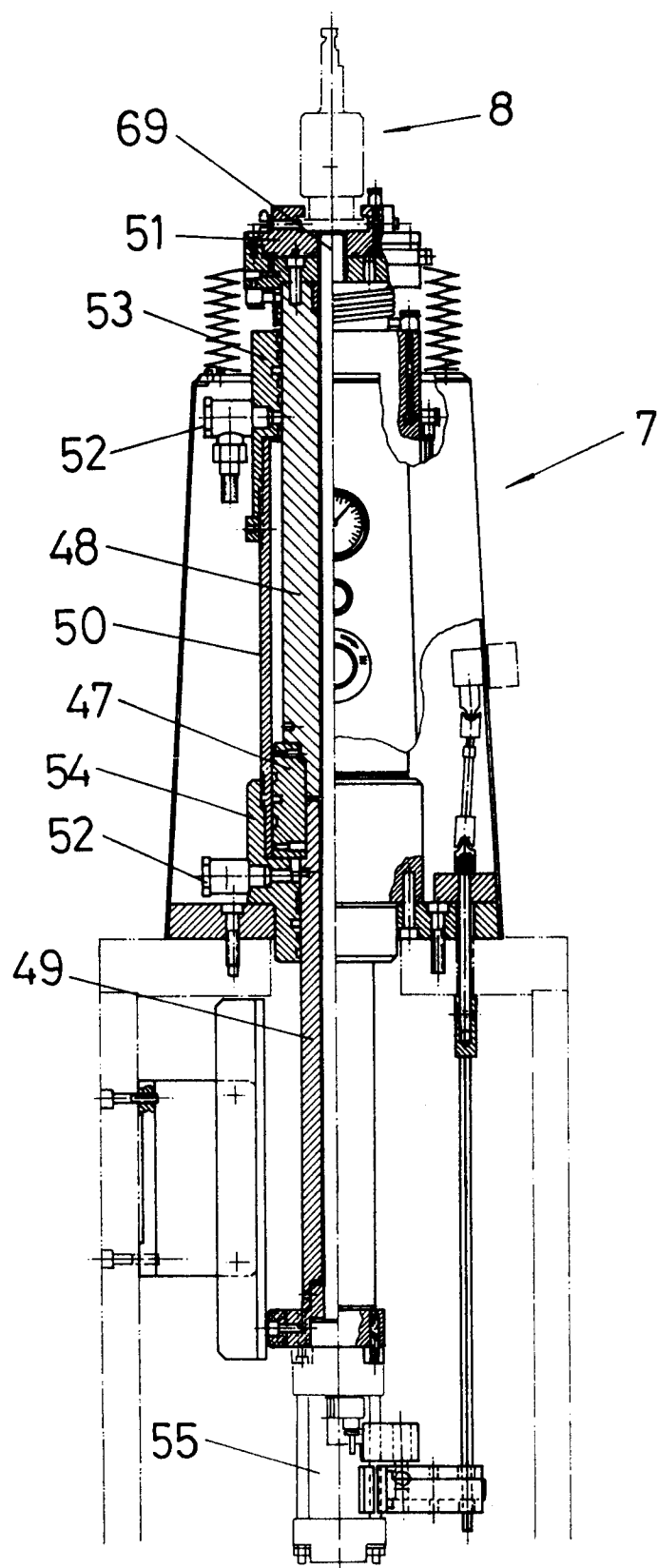


FIG. 8

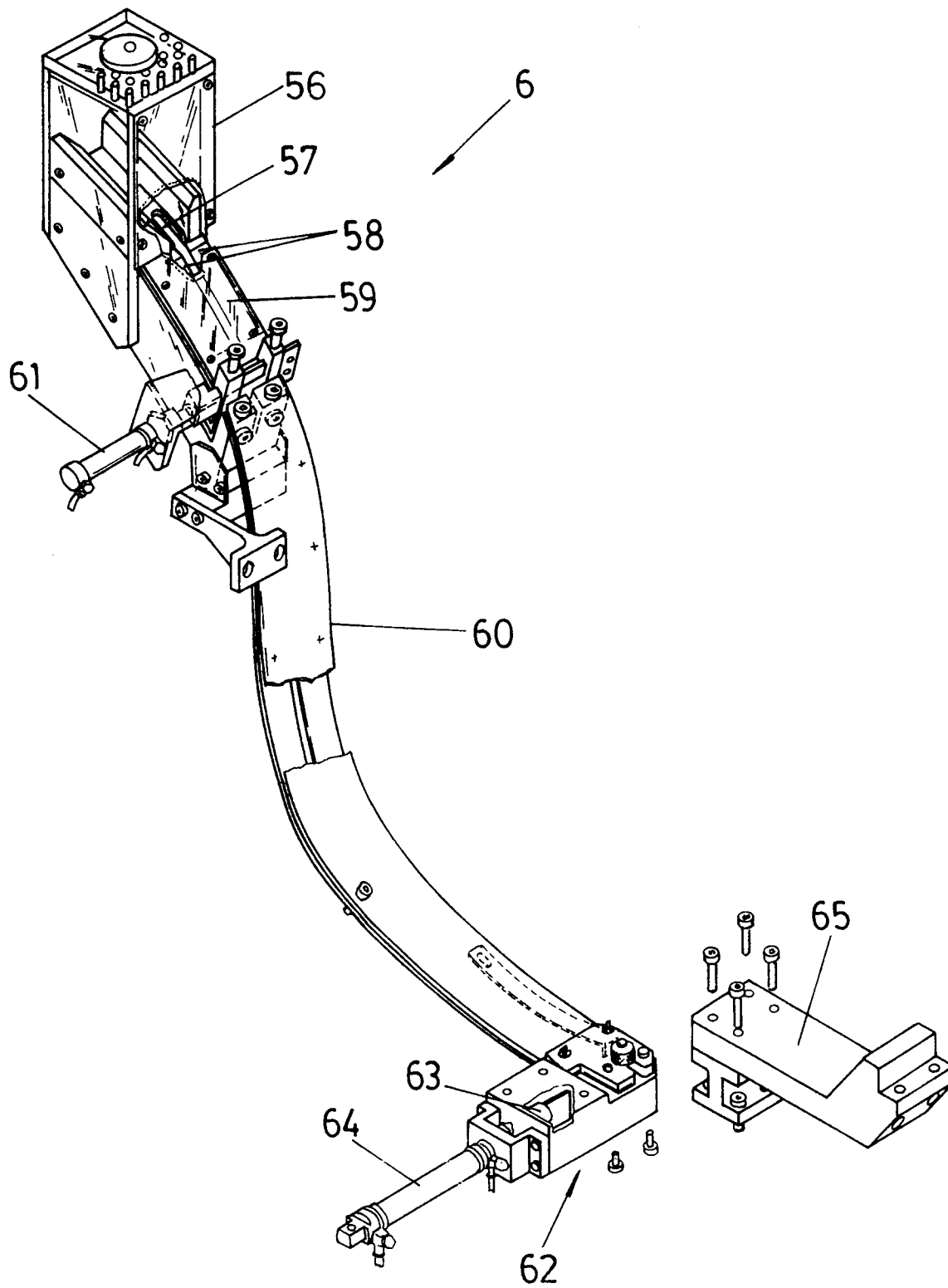


FIG. 9

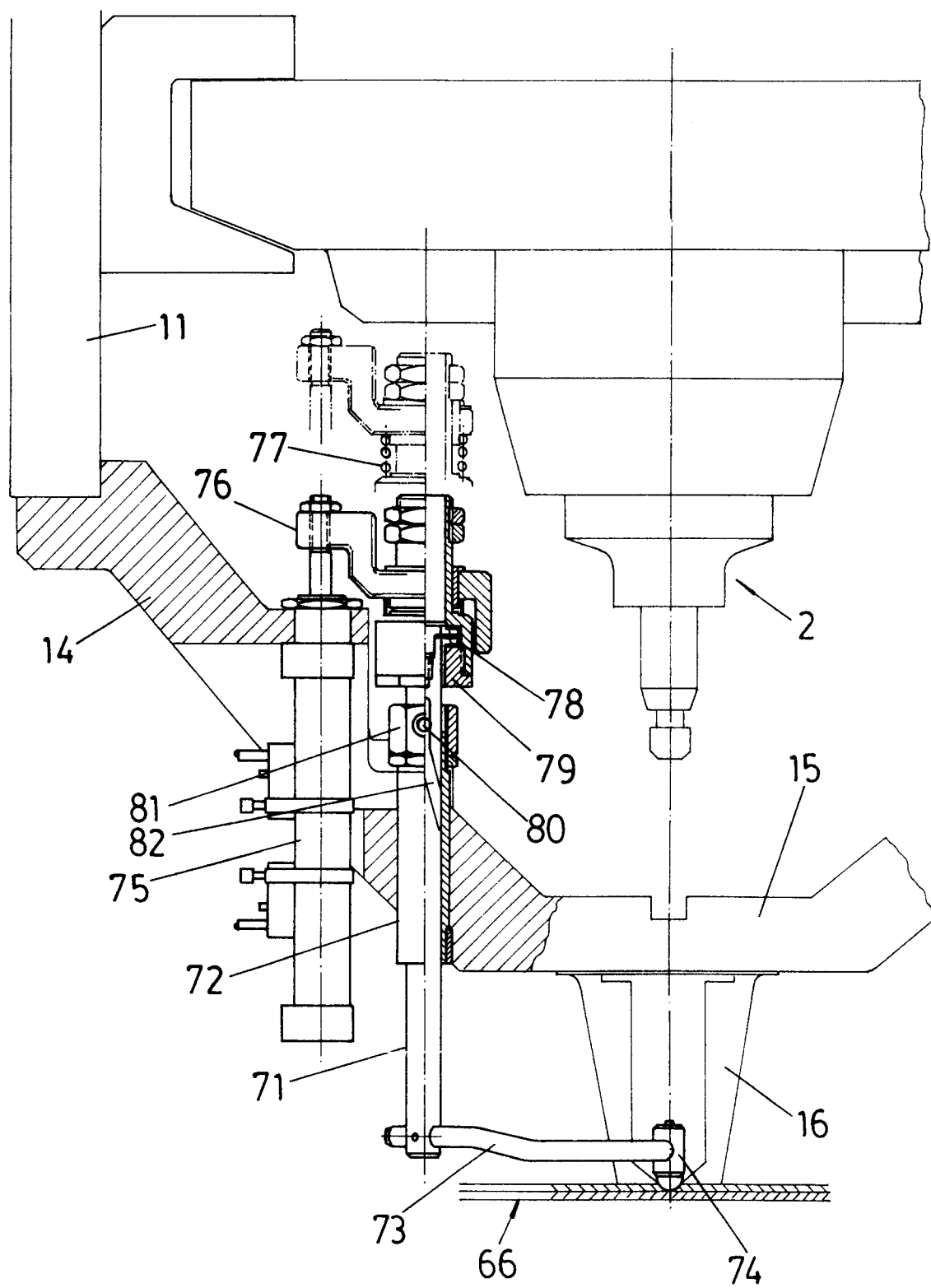


FIG. 10

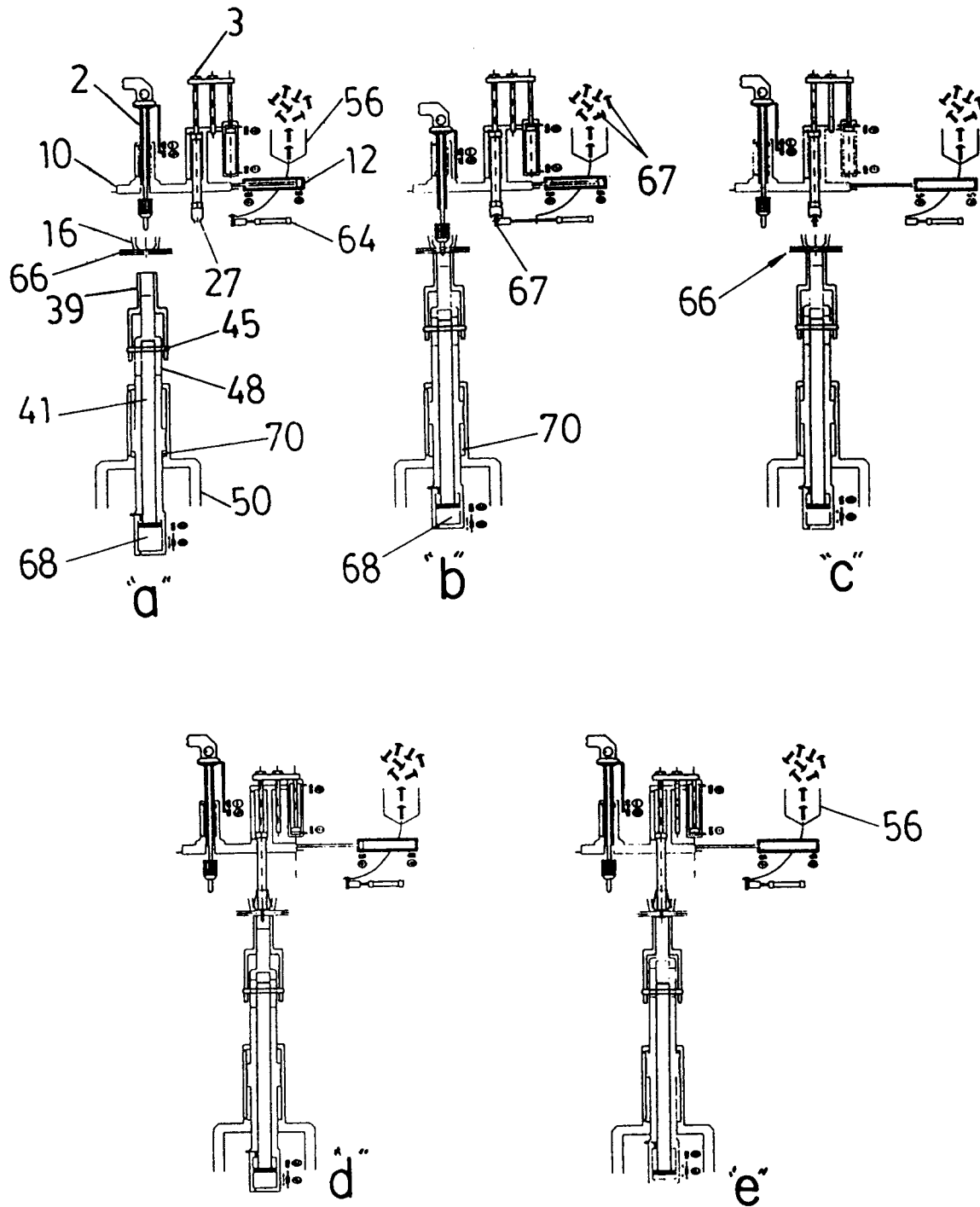


FIG. 11

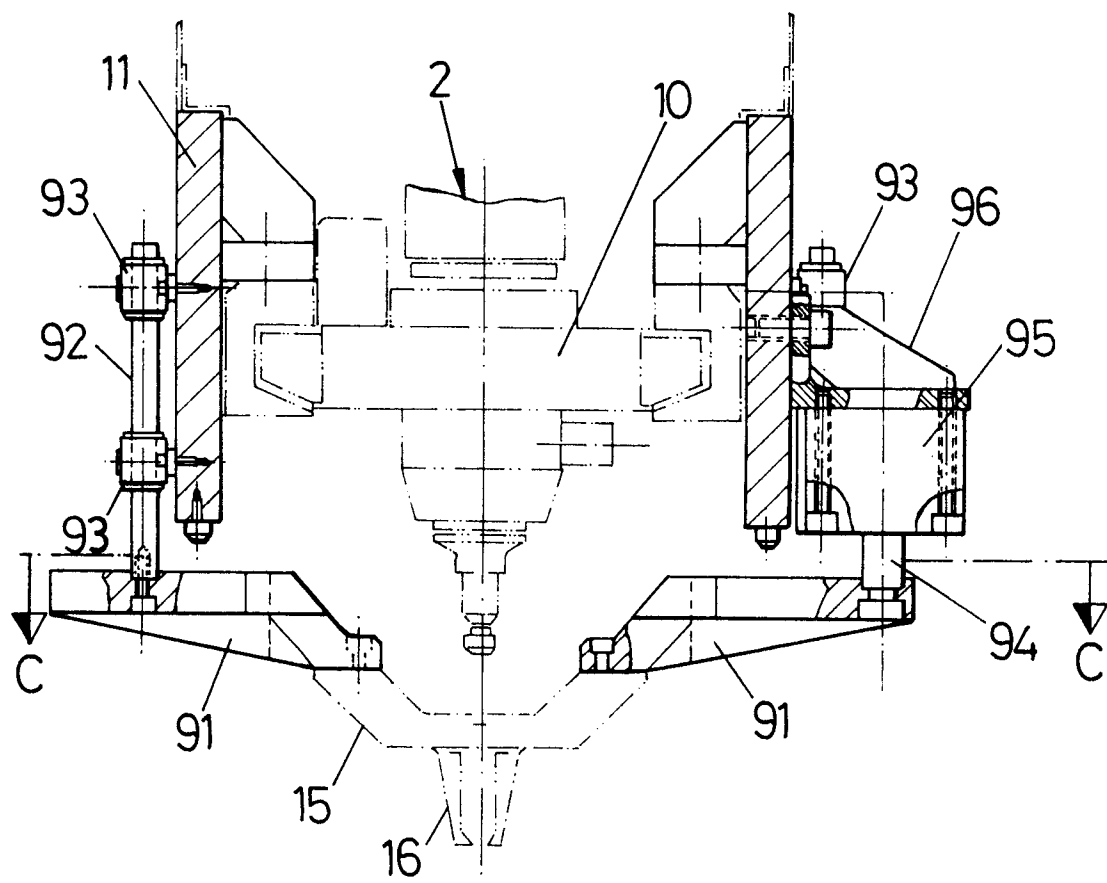


FIG. 12

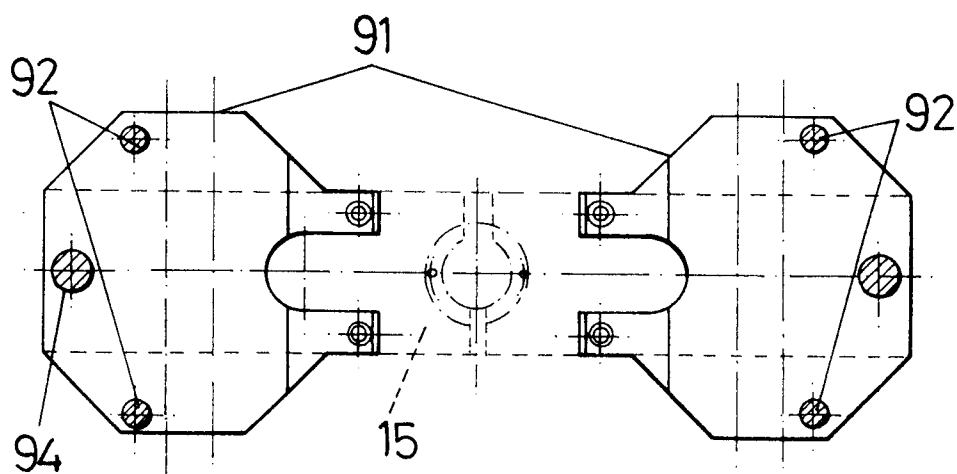


FIG. 13
C-C

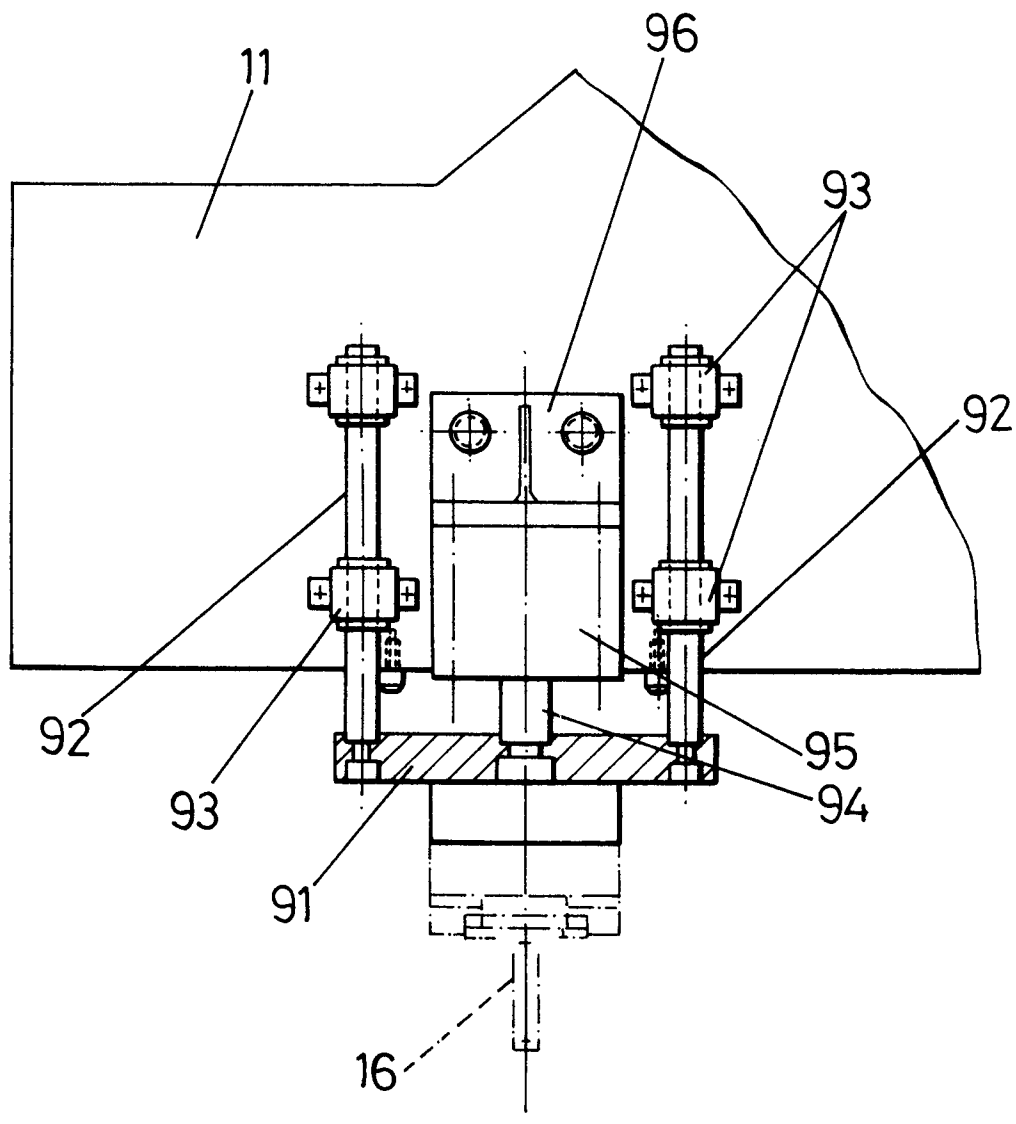


FIG. 14



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 20 1290

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.5)
D,Y	EP-A-0 402 222 (AVIONS MARCEL DASSAULT-BREGUET AVIATION)	1	B21J15/02 B21J15/10
D,A	* column 3, line 30 - column 4, line 55; claims 1-4; figures 1-7 *	3,5	

D,Y	US-A-4 955 119 (BONDI)	1	
D,A	* column 5, line 52 - line 64 *	2,3,5	
	* column 6, line 43 - column 8, line 24 *		
	* column 9, line 34 - line 62; figures 3-15 *		

D,A	US-A-2 063 691 (MARCHANT)	1,3	
	* page 1, right column, line 52 - page 2, left column, line 52; figures *		

D,A	US-A-3 030 832 (FILANGERI)	1,3	
	* column 3, line 24 - line 33 *		
	* column 5, line 1 - line 48; figures *		

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B21J
Place of search THE HAGUE		Date of completion of the search 28 JULY 1992	Examiner BARROW J.
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	