Application No. 60760/86

COMMONWEALTH of AUSTRALIA

PATENTS ACT 1952

599595

AMENDED

APPLICATION FOR A STANDARD PATENT

I/We

KRONE AKTIENGESELLSCHAFT, of
Beeskowdamm 3-11,
D-1000 Berlin 37,
FEDERAL REPUBLIC OF GERMANY.

hereby apply for the grant of a Standard Patent for an invention entitled:

"LOAD-BREAKING SWITCH OF A HIGH-VOLTAGE SWITCHGEAR UNIT (THREE-PHASE CIRCUIT BREAKER)"

which is described in the accompanying ~~provisional~~ complete specification.

Details of basic application(s):—

Number	Convention Country	Date
P 35 30 960.1	FEDERAL REPUBLIC OF GERMANY	27th August, 1985

ACCEPTED AND AMENDMENTS
FILED 15.5.90

The address for service is care of DAVIES & COLLISON, Patent Attorneys, of 1 Little Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia.

Dated this 28th day of January, 19 87.

H. W. Rimington

To: THE COMMISSIONER OF PATENTS

.....
(a member of the firm of DAVIES & COLLISON for and on behalf of the Applicant).

86-022

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

DECLARATION IN SUPPORT OF CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT

Insert title of invention.

In support of the Application made for a patent for an invention entitled "LOAD-BREAKING SWITCH OF A HIGH-VOLTAGE SWITCH GEAR UNIT (THREE-PHASE CIRCUIT BREAKER)"

Insert full name(s) and address(es) of declarant(s) being the applicant(s) or person(s) authorized to sign on behalf of an applicant company.

+ Dr Gerhardt Wolff and Helmfried Schmidt-Reiche, We of
KRONE AKTIENGESELLSCHAFT
Beeskowdamm 3-11
D-1000 Berlin 37
FEDERAL REPUBLIC OF GERMANY

do solemnly and sincerely declare as follows :-

Cross out whichever of paragraphs 1(a) or 1(b) does not apply

1(a) relates to application made by individual(s)
1(b) relates to application made by company; insert name of applicant company.

1. (a) ~~I am~~ We are ~~the applicant ..... for the patent~~

or (b) I am authorized by

KRONE AKTIENGESELLSCHAFT

the applicant..... for the patent to make this declaration on ~~its~~ their behalf.

Cross out whichever of paragraphs 2(a) or 2(b) does not apply

2(a) relates to application made by inventor(s)
2(b) relates to application made by company(s) or person(s) who are not inventor(s); insert full name(s) and address(es) of inventors.

2. (a) ~~I am~~ We are ~~the actual inventor ..... of the invention~~
Gisbert Bruggemann
Weilerstrasse 38
7140 Ludwigsburg/Poppenweiler;
Manfred Matlanga
Liebenzeller Str. 12
7140 Ludwigsburg; and

or (b)
Jeffrey Allan Glen
140 Lousia Road
Birchgrove NSW 2041
AUSTRALIA

~~is~~ are the actual inventor..S..... of the invention and the facts upon which the applicant.....
~~is~~ are entitled to make the application are as follows :-

State manner in which applicant(s) derive title from inventor(s)

The applicant would, if the patent were granted upon an invention by the said inventors, be entitled to have the patent assigned to it.

Cross out paragraphs 3 and 4 for non-convention applications. For convention applications, insert basic country(s) followed by date(s) and basic applicant(s).

3. The basic application..... as defined by Section 141 of the Act ~~was~~ were made
in Federal Republic of Germany on the 27th August, 1985
by KRONE GmbH
in ..... on the .....
by .....
in ..... on the .....
by .....

4 The basic application..... referred to in paragraph 3 of this Declaration ~~was~~ were the first application..... made in a Convention country in respect of the invention the subject of the application.

Insert place and date of signature.

Declared at Berlin this 27 day of November 1989

Signature of declarant(s) (no attestation required)

KRONE Aktiengesellschaft

Dr. Gerhardt Wolff
Member of the Board

Helmfried Schmidt-Reiche
Executive Secretary

Note Initial all alterations.

DAVIES & COLLISON, MELBOURNE and CANBERRA.

(12) PATENT ABRIDGMENT (11) Document No. AU-B-60760/86
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 599595

(54) Title
THREE PHASE CIRCUIT BREAKER

International Patent Classification(s)
(51)[4] H01H 033/50 H01H 033/40 H01H 033/60

(21) Application No. : 60760/86 (22) Application Date : 31.07.86

(30) Priority Data

(31) Number (32) Date (33) Country
3530960 27.08.85 DE FEDERAL REPUBLIC OF GERMANY

(43) Publication Date : 12.03.87

(44) Publication Date of Accepted Application : 26.07.90

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(74) Attorney or Agent
DAVIES & COLLISON, MELBOURNE

(56) Prior Art Documents
CA 1028739

(57) Claim

1. A load-breaking three phase switch of a high-voltage switchgear unit comprising three switching elements, each movable to effect connection between a respective pair of electrical contacts, which elements can be brought from one to the other of an engaged switching condition and a disengaged switching condition, by means of an engagement and disengagement means, characterized in that a locking device is provided on at least one of the switching elements for locking the switch in the "on" position wherein the elements are each in an engaged switching condition, and further characterized in that the three switching elements are connected to each other by means of a bridge made of insulating material in such a way that on activation of one of the switching elements by means of the engagement and disengagement means all switching elements are together switchable, being both locked by said locking device or devices, and connected by said bridge, when in said "on" position.

599595

COMMONWEALTH OF AUSTRALIA

PATENT ACT 1952

COMPLETE SPECIFICATION

(Original)

FOR OFFICE USE

Class Int. Class

Application Number: 60760/86
Lodged:

Complete Specification Lodged:
Accepted:
Published:

Priority:

Related Art:

This document contains the amendments made under Section 49 and is correct for printing

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1 Little Collins Street, Melbourne, 3000.

Complete Specification for the invention entitled:

"LOAD-BREAKING SWITCH OF A HIGH-VOLTAGE SWITCHGEAR UNIT (THREE-PHASE CIRCUIT BREAKER)"

The following statement is a full description of this invention, including the best method of performing it known to us :-

Load-breaking switch of a high-voltage switchgear unit (three-phase circuit breaker)

The invention relates to load-breaking switches, and in particular to load-breaking switches for use with a high-voltage switchgear unit (three-phase circuit breaker).

Such switches may comprise three switching elements, each connecting two electrical contacts and provided with a locking device, which can be brought from the "on" position to the "off" position by means of an engagement and disengagement means (manual snap-action operating mechanism).

A load-breaking switch of the above type is previously known from German Patent 22 40 492. The special design of the individual switching elements in this load-breaking switch is disclosed in greater detail in German Patent 22 29 865. The individual switching elements of the load-breaking switch are switched on or off individually in succession by means of the engagement and disengagement tool (manual snap-action operating mechanism). The disadvantage of this single-pole switching lies in the fact that under specific conditions of a power supply system single-pole switching leads to relatively high overvoltages as a result of the switching process. In power supply systems the neutral points of which are earthed by arc-suppression coils in particular these overvoltages may occur on the switching off of large proportions of the power supply system, for example if only 80 or 90% of the power of the supply system is switched off in a switching process. A further disadvantage of single-pole switching lies in the fact that electric motors connected to the supply system which are not adequately protected with fuses through a motor-protection circuit may be damaged after the switching off of one phase during operation in the meantime with only two phases.

Three-pole switchable load-breaking switches for high voltage switchgear units are indeed disclosed in German Patent 29 07 559. These, however, are not of the type first above described.

The invention is based on the problem of further developing a load-breaking switch of a high-voltage switchgear unit (three-phase switch) of the first above described type to such an extent that all three switching elements, and thus all three phases of the power supply system, can be switched on or off simultaneously.

The solution of this problem is obtained according to the invention in that the three switching elements are connected to each other by means of a bridge made of insulating material in such a way that on activation of one of the switching elements all switching elements are together switchable. Through the connection of all three switching elements with each other by way of the insulating material bridge it is achieved in accordance with the invention that on the activation of only one of the switching elements, preferably the central switching element, all three elements can be switched together. In this case the design of the load-breaking switch of a high-voltage switchgear unit required for the type first described above is preserved. The switching elements present are only slightly modified, so that from the load-breaking switch capable of single-pole switching, in which all three phases have to be switched successively, a load-breaking switch capable of three-pole switching is produced, in which all three phases can be switched simultaneously. Here the advantages of three-pole switching, which is in itself of the prior art, are combined with the known and proven design of a ~~load-braking~~ load-breaking switch capable of single-pole switching. It is of particular advantage that subsequent

modification of existing load-breaking switches is possible very easily. It is necessary merely to replace the switching elements. No modifications to the fixed parts of the high-voltage switchgear unit are necessary.

According to a first aspect of the present invention, there is provided a load-breaking three phase switch of a high-voltage switchgear unit comprising three switching elements, each movable to effect connection between a respective pair of electrical contacts, which elements can be brought from one to the other of an engaged switching condition and a disengaged switching condition, by means of an engagement and disengagement means, characterized in that a locking device is provided on at least one of the switching elements for locking the switch in the "on" position wherein the elements are each in an engaged switching condition, and further characterized in that the three switching elements are connected to each other by means of a bridge made of insulating material in such a way that on activation of one of the switching elements by means of the engagement and disengagement means all switching elements are together switchable, being both locked by said locking device or devices, and connected by said bridge, when in said "on" position.

According to a second aspect of the present invention, there is provided a load-breaking three phase switch of a high voltage switchgear unit comprising three switching elements, each movable to effect connection between a respective pair of electrical contacts and provided with a locking device, which elements can be brought from one switching condition to another by means of an engagement and disengagement means, the three switching elements being carried by respective insulative caps which are slidable over projecting insulative portions of a housing of the switch, for moving the switching elements between said switching conditions, said caps being connected

to each other by means of a bridge made of insulating material in such a way that on activation of one of the switching elements all switching elements are together switchable.

Further advantageous embodiments of the invention can be seen from the subsidiary claims. Thus provision can be made in particular for the locking device for the switching elements to be incorporated only into the central of the three switching elements, whereas the two outer switching elements, in contrast to the state of the art as in German Patent 22 40 492 do not have any locking device. The locking force to be overcome on switching on or cff by means of the engagement and disengagement tool (manual snap-action mechanism) is then no greater than in the case of single-pole switching.

The invention is described below, by way of example only, by means of an embodiment of a load-breaking switch of a high-voltage switchgear unit (three-phase circuit-breaker) shown in greater detail in the drawings, which illustrate respectively:

Fig. 1 the high-voltage switchgear unit (three-phase switch) with the load-breaking switch in the "on" position,

Fig. 2 a view of the load-breaking switch from above

Fig. 3 the load-breaking switch introduced into the high-voltage switchgear unit, but not yet switched on,

Fig. 4 a side view of the load-breaking switch,

Fig. 5 an enlargement of the ~~deatil~~ detail A in fig. 1 with the locking device in the central switching element,

Fig. 6 the high-voltage switchgear unit with a diagrammatical representation of the central tubular switching element provided with the locking device,

Fig. 7 a diagrammatical front elevation according to the arrow Z in fig. 6,

Fig. 8 a partially cut away side elevation of the engagement and disengagement tool (manual snap-action operating mechanism) and

Fig. 9 a section along the line B-B in fig. 8.

The high-voltage switchgear unit 63 shown in fig. 1 corresponds in its basic structure to the high-voltage switchgear unit according to German Patent 22 40 492. The two-part plastic housing of the high-voltage switchgear unit 63 bears on its lower side three connection terminals 64, 65, 66 for the three phases R, S, T of a high-voltage three-phase system. These are each connected inside the housing by conductor bars 42 to a main contact piece 33, as is shown in fig. 3. In addition, three counter-contacts 43 provided with pick-ups are disposed in the housing of the high-voltage switchgear unit 63 at a distance from the main contact pieces 33. These counter-contacts can be connected with the main contact pieces 33 by tubular switching elements 11, 12, 13, as is described in greater detail in German Patent 22 40 492. The special design of the individual tubular switching elements 11,12, 13 is described in detail in German Patent 22 29 865.

Each tubular switching element 11, 12, 13 comprises essentially a tubular main circuit 14 which is used for the electrical connection of a main contact piece 33 with a counter-contact 43 and a coupling connection 24, 35 for the closed position, which is not described in detail here. At the outer end of each tubular main circuit 14 a moulded-plastic sleeve 30 is attached. At the free end of this moulded-plastic sleeve 30 a cup-shaped moulded-plastic hood 31 is disposed which surrounds the moulded-plastic sleeve 30 and part of the tubular main circuit 14, but is not in contact with it, as is shown in particular in fig. 3. In the "on" position as shown in fig. 1, the moulded-plastic hoods 31 surround sleeve-like insulating elements 78 which are attached to the housing of the high-voltage switchgear unit 63 as is shown in fig. 6.

The moulded-plastic hoods 31 of the three switching elements 11, 12, 13 are provided, at the ends directed towards the main circuit 14, with external ribs 85 to which a cylindrical section 86 abuts towards the other end. The cylindrical sections 86 of the moulded-plastic hoods 31 are mounted in a moulded-plastic bridge 10, as is shown in particular in figs. 3, 4 and 5.

The moulded-plastic bridge 10 is U-shaped in cross-section (fig. 4), the lateral arms 87 being inclined outwards from the centre, as is shown in fig. 3. The base 88 of the U-shaped moulded-plastic bridge 10 is provided with three drilled holes 77, to the central hole 77 of which a tubular piece 76 is connected which is permanently joined to the base 88. The two outer holes 77 are provided only with slip-on tubular pieces 76. The three switching elements 11, 12, 13, with the cylindrical sections 86 of their moulded-plastic hoods 31 are inserted from the base 88 into the tubular sections 76, the ribs 85 coming to lie adjacent to the base 88 of the moulded-plastic bridge . The tubular pieces 76 slipped on in this way are secured by wedges 18 to the cylindrical section 86 of the moulded-plastic hoods 31. The wedges 18 are secured to all three switching elements 11 to 13 by securing screws 71, the protruding heads of which prevent the engagement of a manual snap-action operating mechanism for single-pole switching.

The three switching elements 11, 12, 13 are thus rotatably mounted in the moulded-plastic bridge 10, but axially secured in a form-fitting manner between the ribs 85 and the wedges 18. The switching elements 11, 12, 13 and the moulded-plastic bridge 10 thus form a single constructional unit. Three openings 73 are formed in the base 88 of the moulded-plastic bridge 10 for the passage of voltage detectors to each switch element 11 to 13.

In the central switching element 12 a locking device 44 is disposed which is shown in detail in fig. 5. This comprises two locking pins 45 inserted into the moulded-plastic sleeve 30 of the main circuit 14, which are directed radially outwards under the action of an inner compression spring 46. In a moulded-plastic socket 74 of the sleeve-like insulation section 78 of the fixed high-voltage switchgear unit 63 two locking recesses 47, 48 are formed, separated by an axial distance, the locking pins 45 of the locking device 44 co-operating with these as is shown in figs. 5 to 7. In the "off" position (position a) the locking pins 45 are in the outer recess 48 of the moulded-plastic socket 74 of the insulation section 78. After a clockwise rotation through 90° (fig. 7) the locking pins 45 assume the readiness position for connection (position b), in which the locking pins 45 come to abut stops in the moulded-plastic socket 74. In this rotational position of the switching element

12 it can be pressed by means of the engagement and disengagement tool (manual snap-action operating mechanism) 50, which is shown in detail in fig. 8, in the direction of the arrow Z into the high-voltage switchgear unit 63 in order to connect the three main contacts 33 with the counter-contacts 43 electrically through the main circuits 14. On establishing the connection, the locking pins 45 engage in the axially inwardly located locking recess 47 (position c).

Since when the central switching element 12 is forced over the moulded-plastic bridge 10 the outer switching elements 11, 13 are also carried with it, a three-pole switching of all three phases of the high-voltage switchgear unit 63 is effected by a single switching process. It is pointed out again here that the outer switching elements 11, 13 do not have any locking devices.

To switch off the high-voltage switchgear unit 63, the switching elements 11, 12, 13 must be withdrawn by means of the tool 50, the locking force of the locking spring 46 of the locking pins 45 of the locking device 44 of the central switching element 12 which are engaged in the locking recesses 47 having to be overcome. A tension spring 75 is used for the automatic resetting of the central switching element 12 on switching from the position b to the position a. The engagement and disengagement tool (manual snap-action operating mechanism) 50 is shown in fig. 8. This comprises a handle 58, a connection head 81 for engagement in the mounting 82 of the central switching element 12, and two spring devices 51 connected in parallel and connecting the handle 58 and the connecting head 81. Each spring device 51 comprises a telescopic housing 80 and two sleeves 52, 62 engaging one within the other and capable of sliding in relation to each other. The sleeve 62 is permanently connected to a front plate 60 fixedly attached to the handle 58. The sleeve 52 can slide freely in the sleeve 62 and is forced out of the sleeve 62 as far as the stop 41 by the action of a compression spring 54 supported agaisnt the bottom of the sleeve 52. The compression spring 54 is supported on the bottom of the sleeve 62 by means of a plate 89. The free end of the sleeve 52 is received for sliding on a tubular section 90, which, for the connection of the two telescopic housings 80, is fixedly connected to a face plate 59, which in turn bears the connecting head 81. The head 91 of a push rod 92, the other end of which is securely screwed to the plate 89 of the compression spring 54, is guided for sliding motion in the tubular section 90.

The connecting head 81 is connected by a tubular extension 93, 93' of a disc-shaped coupling part 55 to the face plate 59. On the tubular extension 93, 93' a capping sleeve 56, the end positions of which are limited by the face of the face plate 59 and a pin 94 respectively, is mounted for axial movement in response to the action of a compression spring 69. The tubular extension 93, 93' of the coupling part 55 is formed as a coupling by a plane of separation 93" which is V-shaped in side view and which is held by means of a compression spring 68 acting on an inner sleeve 55". The compressive spring 68 pulls, by way of the sleeve 55", the coupling part 55 fitted to the tubular extension 93' against the tubular extension 93 connected fixedly to the face plate 59 through the V coupling, so that the coupling part 55 is entrained when the central switching element 12 is rotated from position a into position b (fig. 7). If an angle of more than 90° is to be covered, i.e. beyond the position b, the coupling part 55 of the connecting head 81 locks through the V-coupling 93" and the spring 68. Thus it is assured that no damage can be caused to the locking device 44, the locking positions of which are disposed at an angle of 180° to each other, by excessive forces from the tool 50 acting on the switching element 12.

The disc-shaped coupling part 55 is disposed inside a cylindrical recess on the face of the capping sleeve sleeve 56. The coupling part 55 is provided with a slot 55' on one side and has on the side radially opposite to this a guide pin 72. A guide pin 57 stressed by a compression spring 67 is disposed to slide in the head 83 of the coupling part 55. The head 83 shown in cross-section in fig. 9 has a recess 84, so that the head 83 is formed oval in cross-section behind a flat, disc-shaped head section. Rubber pads 95 are placed over the spring devices 51 to protect the operator.

The mounting formed on the face of the switching element 12 is a component of the face of the moulded-plastic hood 31. The mounting 82 comprises a keyhole-shaped opening 32 with a slot 34 running from it. A securing screw 71 is screwed axially into the moulded-plastic hood and at the same time bears the wedge 18 for securing the moulded-plastic bridge 10. For the switching on and off of the switching elements 11, 12, 13 the connecting head 81 of the tool 50 is inserted into the mounting 82 of the central switching element 12, the head 83 engaging in the opening 32 and the securing screw 71 in the radial slot 55' of the coupling part 55. The pin 72 of the coupling part 55 engages in the slot 34 of the opening 32. The capping sleeve 56 surrounds the cylindrical section 86 of the moulded-plastic hood 31, a slot 56' in the face periphery of the sleeve 56 engaging over the wedge

18. In this way the processes of switching the load-breaking switch on and off can be carried out by means of the tool 50 in the manner described below.

For switching on, the three switching elements 11, 12, 13 are disposed in the high-voltage switchgear unit 63 in such a way that the locking device 44 is in position a (preliminary locking position), in which the locking pins 45 meet a stop 79 which secures the position a. The position a also assures that the lock cannot be overridden on the insertion of the switching element 12.The speed is a decisive factor in electrical switching capability. A constant speed can be achieved only from the rest position of the switching element. After a rotation of the central switching element 12 by means of the handle 58 into the position b, the two compression springs 54 of the two parallel spring devices 51 are compressed by means of the handle 58 until they are fully tensioned. The locking device 44 built into the switching element 12 continues to lock the switching element 12. The switching elements 11, 12, 13 are then engaged in one movement after overcoming the locking device 44. The locking pins 45 then engage in the locking recess 47 (position c in fig. 6).

Switching off is effected by the opposite procedure. Here the tool 50 is again locked in the manner previously described with its connecting head 81 in the mounting 82 of the central switching element 12. By pulling the handle 58 the two compression springs 54 of the spring devices 51 are tensioned, the sleeve 53 sliding on the tubular section 90 and a separation joint 96 opening between the face ends of the sleeves 52 and the face plate 59. It is not until after the complete tensioning of both compression springs 54 that the locking device 44 can be overcome in a single operation, the locking pins 45 being moved out of the locking recess 47 and the structural unit comprising the moulded-plastic bridge 10 and the three switching elements 11, 12, 13 being removed from the switchgear unit 63 and the locking recess 48 being overridden during the switching-off process. Under the action of the tension spring 75 the central switching element 12 is then rotated back into the initial position (position a).

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A load-breaking three phase switch of a high-voltage switchgear unit comprising three switching elements, each movable to effect connection between a respective pair of electrical contacts, which elements can be brought from one to the other of an engaged switching condition and a disengaged switching condition, by means of an engagement and disengagement means, characterized in that a locking device is provided on at least one of the switching elements for locking the switch in the "on" position wherein the elements are each in an engaged switching condition, and further characterized in that the three switching elements are connected to each other by means of a bridge made of insulating material in such a way that on activation of one of the switching elements by means of the engagement and disengagement means all switching elements are together switchable, being both locked by said locking device or devices, and connected by said bridge, when in said "on" position.

2. A load-breaking switch according to claim 1 wherein said engagement and disengagement means operates on said locking device or devices.

3. Load-breaking switch according to either one of claims 1 or 2, wherein a locking device is provided on one only of said switching elements.

4. Load-breaking switch as in any one of the preceding claims, characterized in that the switching elements are connected in a form-fitting manner with the bridge made of insulating material and are mounted rotatably in said bridge.

5. Load-breaking switch as in any one of the preceding claims, characterized in that the switching elements are arranged such that a switching element is central with

respect to the other switching elements and only the central switching element is provided with a locking device.

6. Load-breaking switch as in claim 5, characterized in that the central switching element is provided with a resetting spring which engages with the insulating material bridge.

7. Load-breaking switch as in any one of the preceding claims, wherein said engagement and disengagement means comprises a tool having a handle, a telescopic housing, two sleeves engaging with each other, a compression spring disposed in these and a connecting head for engaging in the mounting of a central switching element of said switching elements, and wherein, in order to increase the spring energy of the tool during the process of switching on and off, two telescopic housings with built-in compression springs are disposed parallel to each other between the handle and the connecting head of the tool.

8. Load-breaking switch as in claim 7, characterized in that the mountings of the switching elements are provided with securing screws for wedges, the heads of which prevent the insertion of atool or other activating means for single-pole switching.

9. Load-breaking switch as in either one of claims 7 or 8, characterized in that the connecting head of the tool is provided with means to prevent any hooking-in of the connecting head into a switching element for single-pole switching.

10. Load-breaking switch according to claim 9 wherein said means to prevent any hooking-in of the connecting head comprises a pin, arranged along the operative axis of said telescopic axis.

11. Load-breaking switch as in any one of claims 1 to 6, characterized in that openings are formed in a base of the insulating material bridge for the passage of voltage detectors to each of the three switching elements.

12. Load-breaking three phase switch of a high voltage switchgear unit comprising three switching elements, each movable to effect connection between a respective pair of electrical contacts and provided with a locking device, which elements can be brought from one switching condition to another by means of an engagement and disengagement means, the three switching elements being carried by respective insulative caps which are slidable over projecting insulative portions of a housing of the switch, for moving the switching elements between said switching conditions, said caps being connected to each other by means of a bridge made of insulating material in such a way that on activation of one of the switching elements all switching elements are together switchable.

13. A load-breaking switch substantially as hereinbefore described with reference to the drawings.

DATED this 19th day of March, 1989.

KRONE AKTIENGESELLSCHAFT
By its Patent Attorneys
DAVIES & COLLISON

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FIG.1

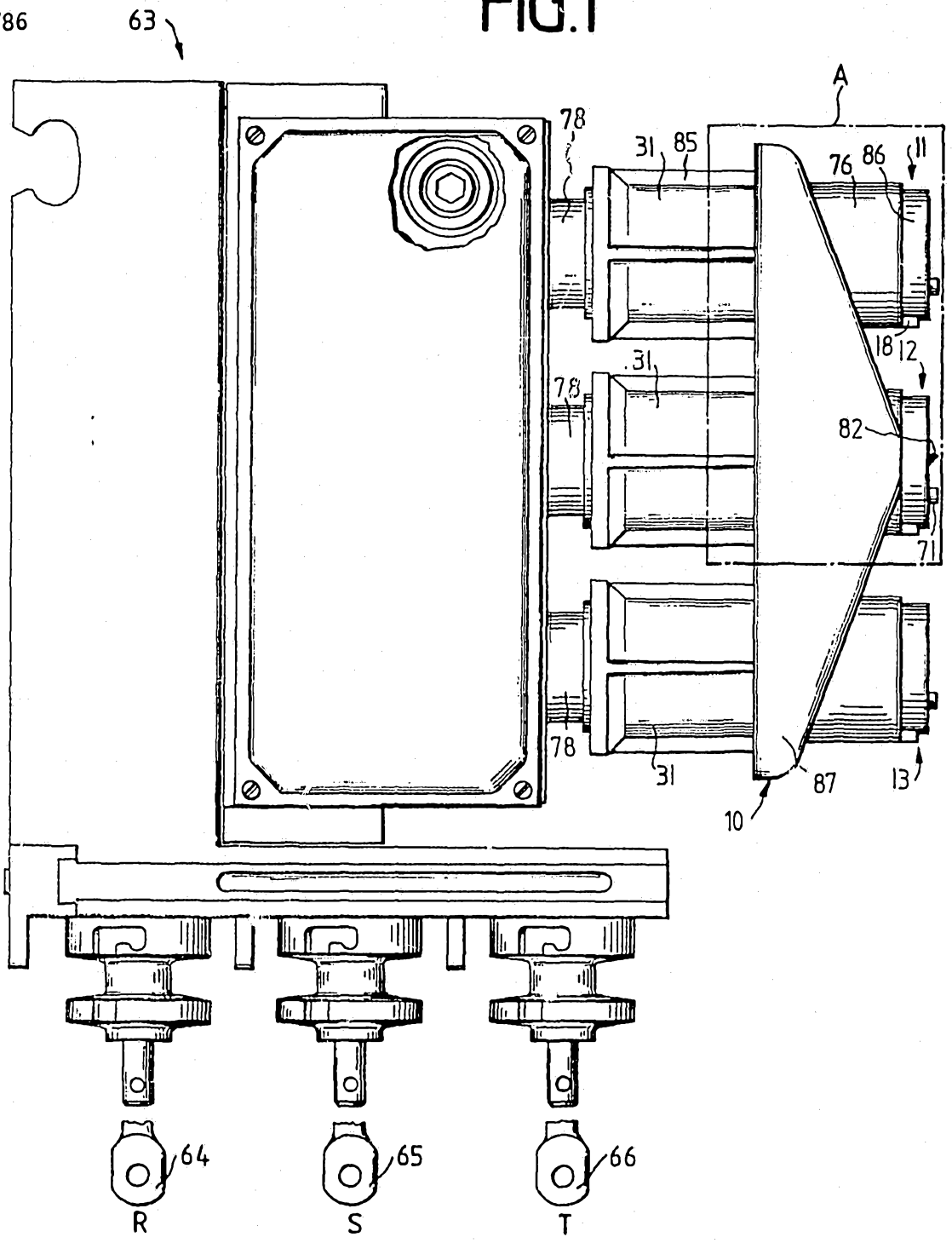
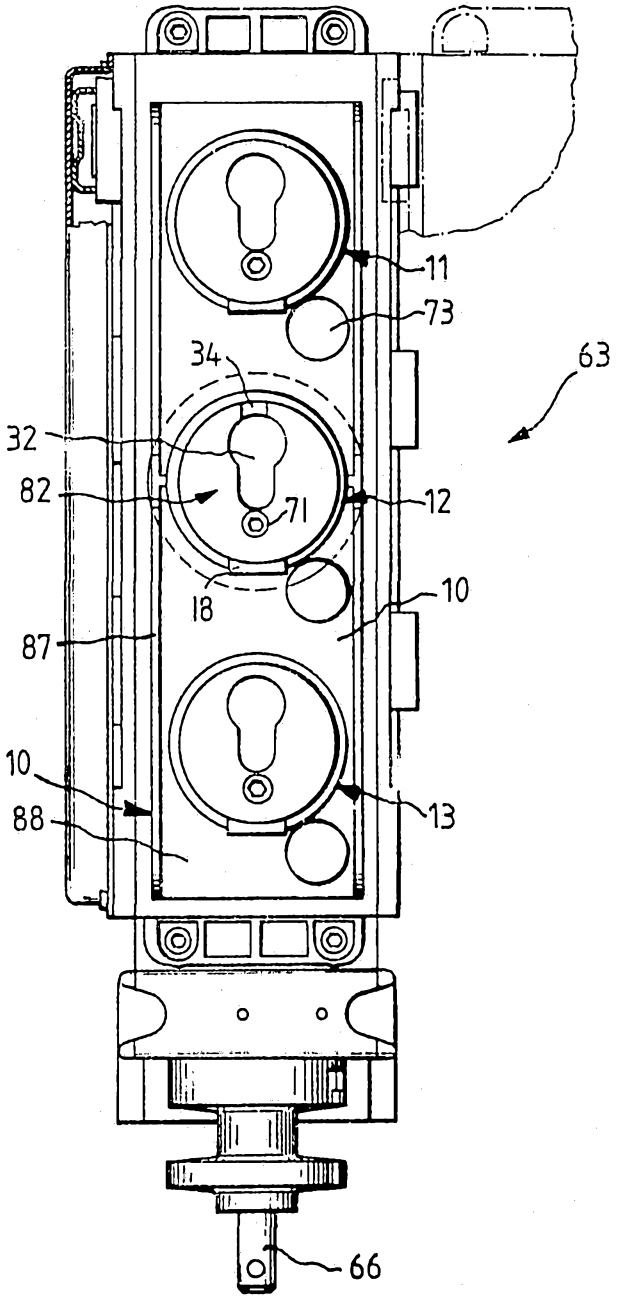


FIG.2



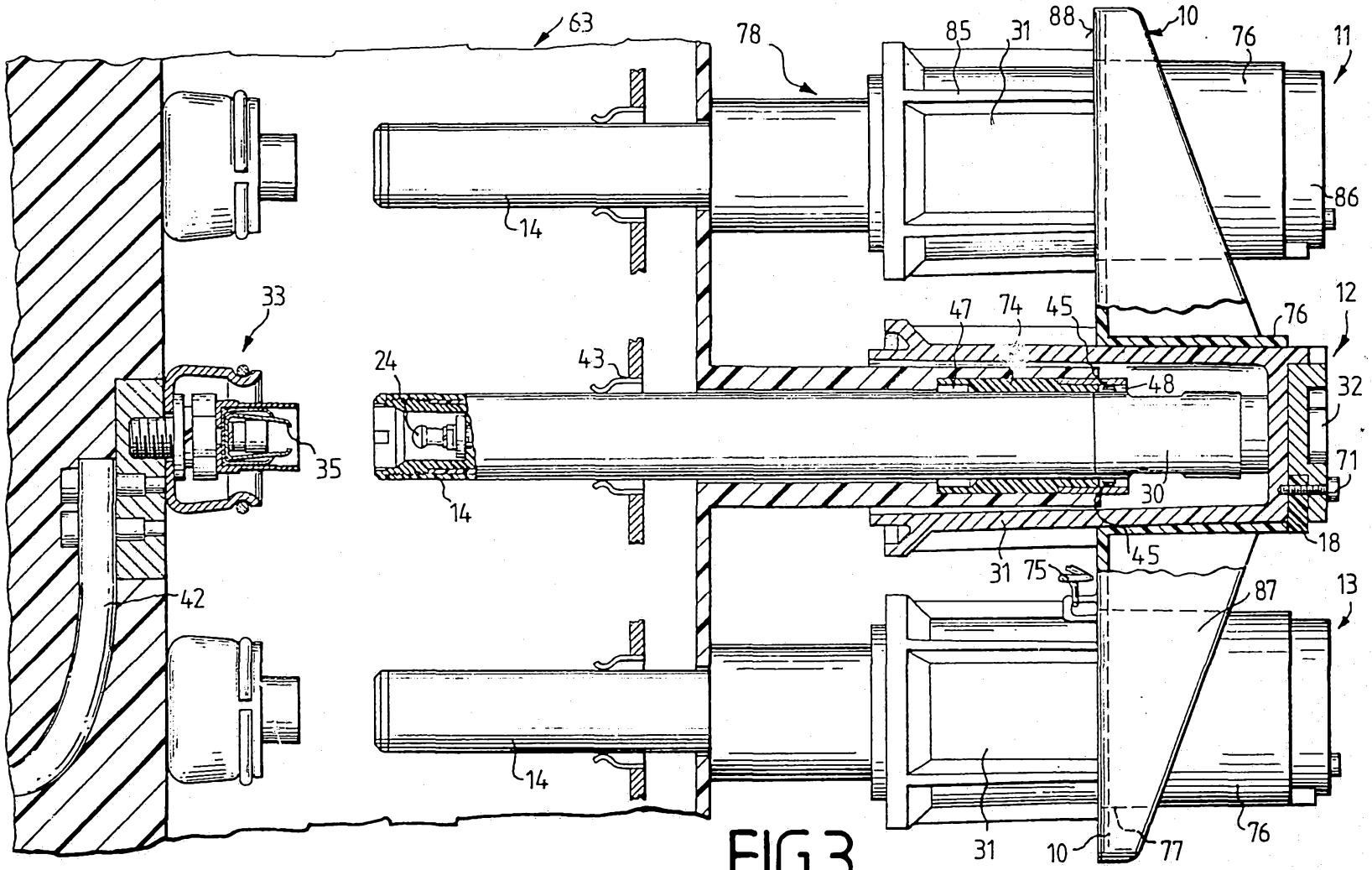

63
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FIG.3

FIG.4

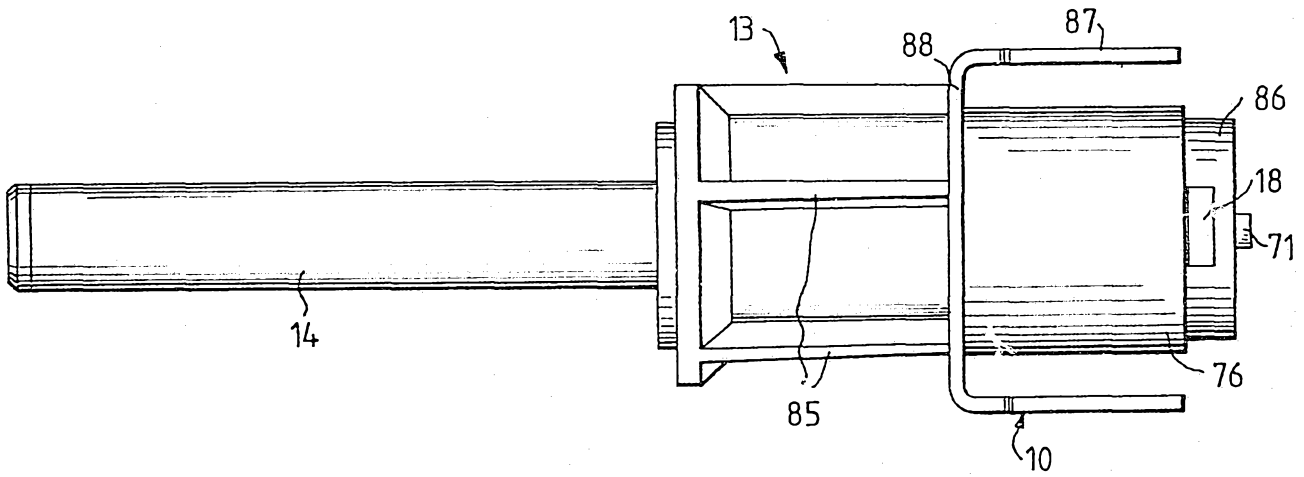

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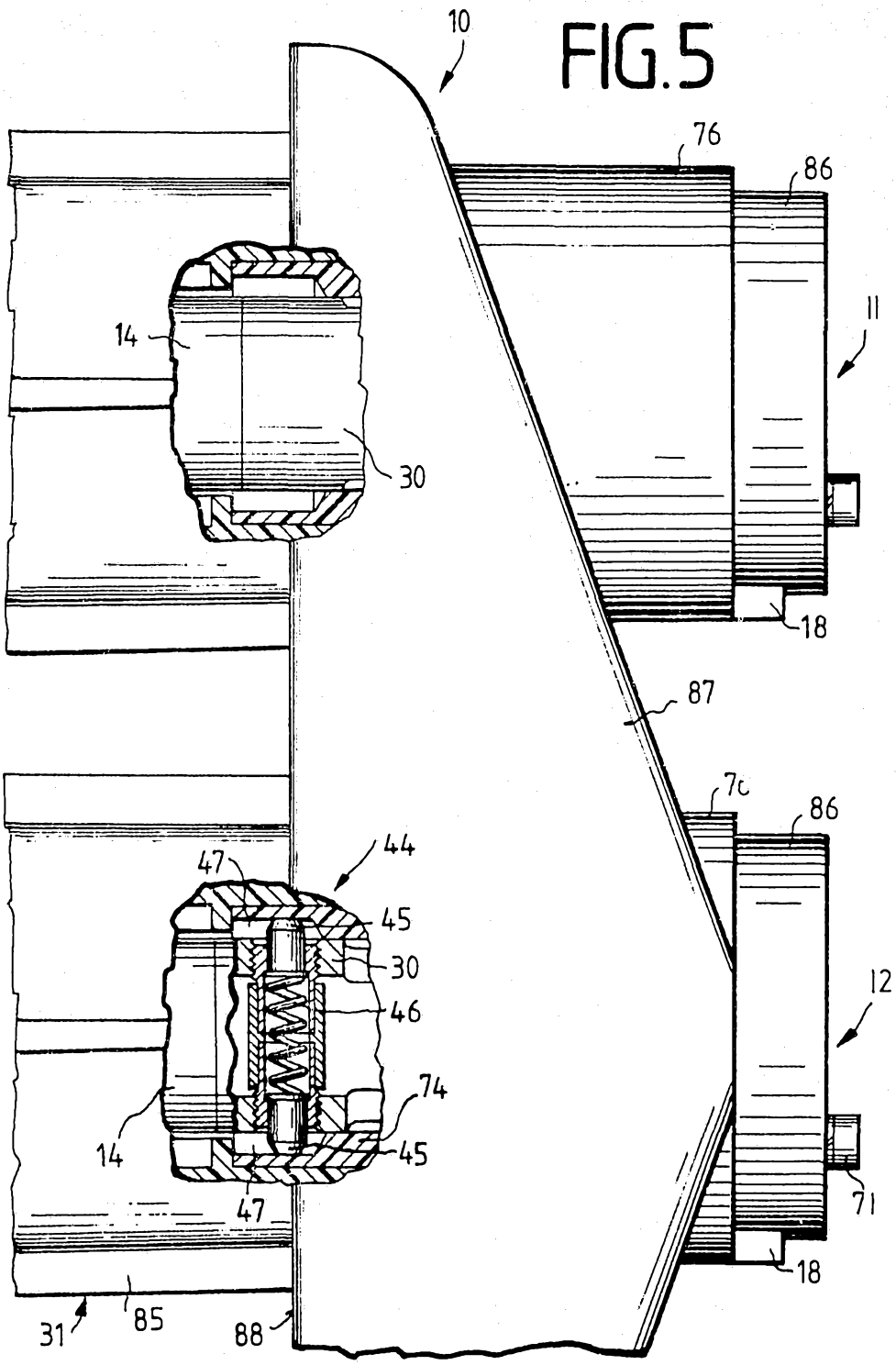
FIG.5



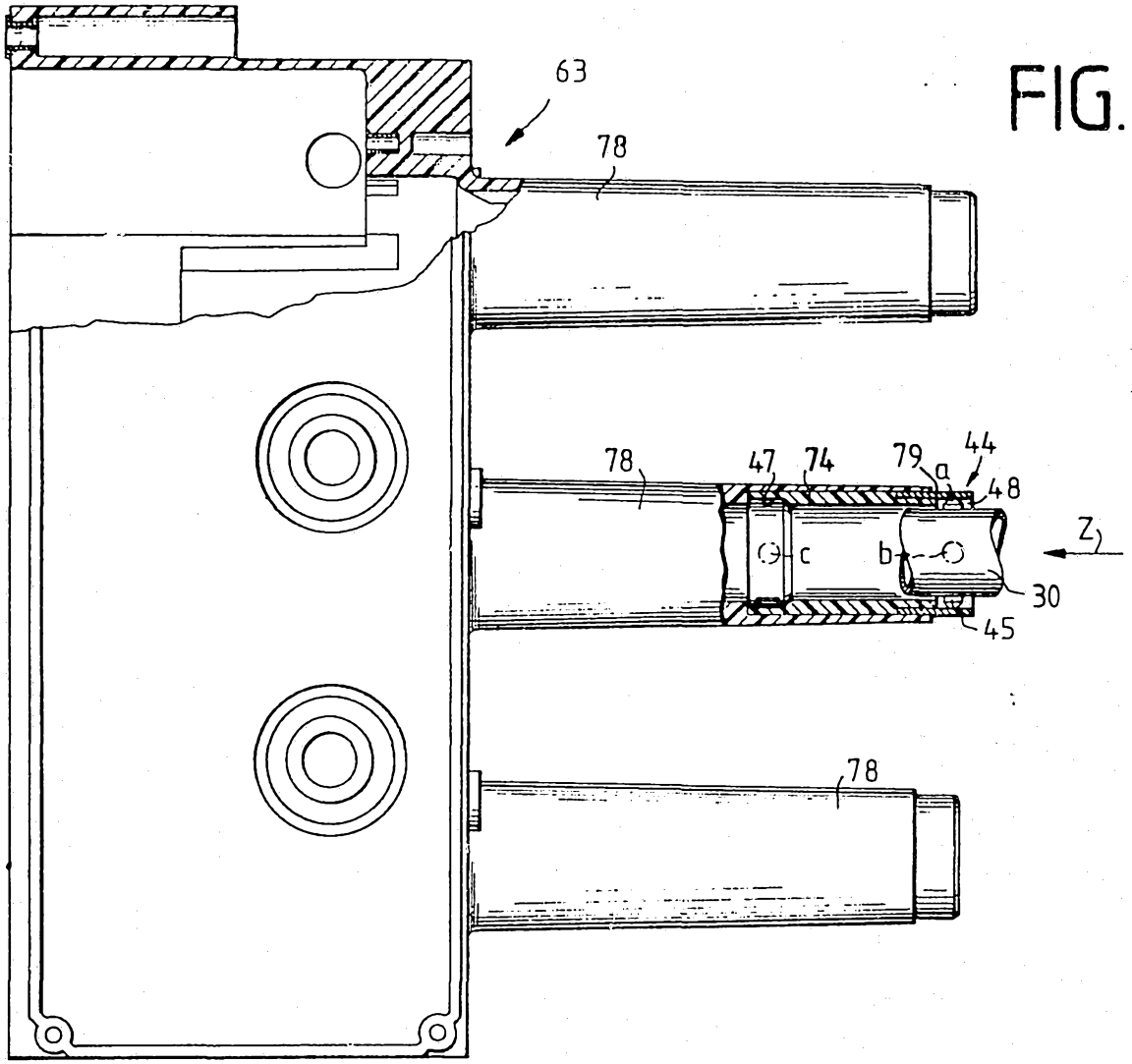


FIG.6

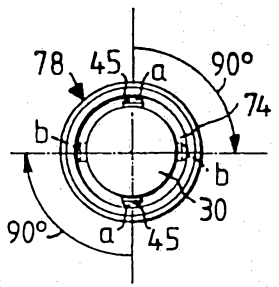
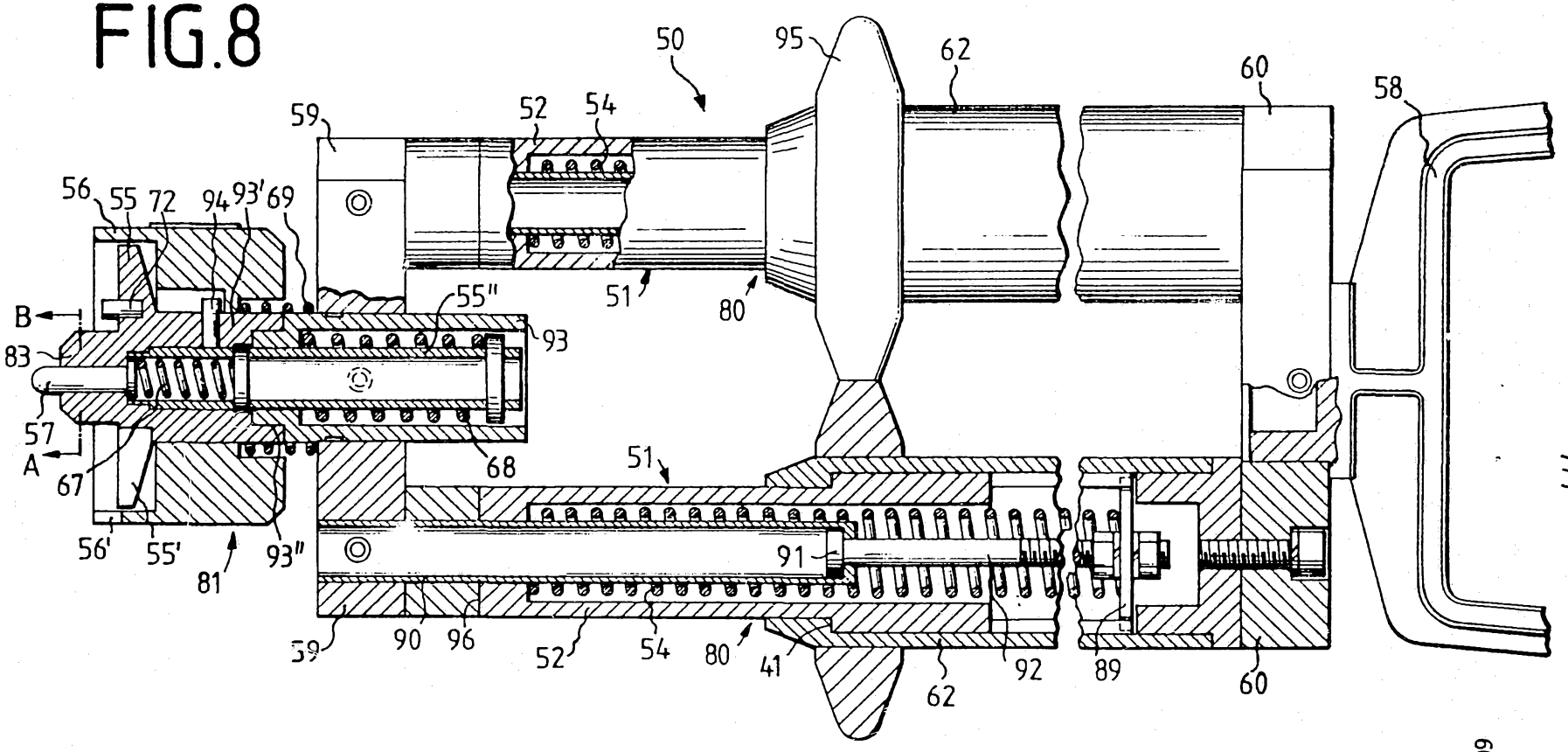


FIG.7

617

FIG.8



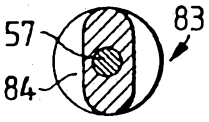


FIG.9