(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 407 150 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90307272.6**

(51) Int. Cl.5: **E05F 3/12**, E05F 3/10

(22) Date of filing: **03.07.90**

(30) Priority: **06.07.89 JP 80481/89**

(43) Date of publication of application:
09.01.91 Bulletin 91/02

(84) Designated Contracting States:
DE FR GB

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(54) Hydraulic control system of floor hinge.

(57) A floor hinge includes a hydraulic control system attaining first and second speed function, a back check function, a latching action function, and a delayed action function in accordance with the position of the door in the respective door open or close angle regions. These functions are performed by the respective adjusting valves (18, 21, 22, 24, 27) which are disposed in the first and second oil passage (34, 35) of the hydraulic oil which flows into the piston front chamber (B) from the piston rear chamber (A) of a cylinder portion (9) of the floor hinge or vice versa in response to the movement of the piston (7) located in the cylinder portion (9).

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HYDRAULIC CONTROL SYSTEM OF FLOOR HINGE

BACKGROUND OF THE INVENTION

The present invention relates to a hydraulic control system of a floor hinge adapted for a right swing door, a left swing door and a biparting door.

A conventional floor hinge of the type described above comprises means for attaining a delayed action function capable of slowly closing the door from a fully open state to a certain open angle state, means for closing the door at a normal closing speed, i.e. first closing speed, from the certain open angle state of the door to an open angle close to a position where the door is completely closed, and means for closing the door at a second closing speed lower than the first closing speed. Another conventional floor hinge is further provided with means for achieving a latching action capable of speedily closing the door at angles of about 2° to 3° just before the door has been closed to completely close the same. A further conventional floor hinge is provided with means for attaining a back check function for prevention of rapid opening of the door to the door with an open angle between a certain open angle to the fully open angle so as to prevent the door, a knob of the door or a wall to which the door is attached from being damaged by an accidental rapid opening of the door by an external force, for example.

In order to attain the back check function, there is provided mechanical means for increasing the door opening force to limit the rapid door opening, and a hydraulic circuit means for limiting the rapid door opening by utilizing a cushioning function of the hydraulic pressure. The hydraulic circuit means includes or does not include a mechanism for minutely adjusting the hydraulic pressure attaining the cushioning function, for example, as disclosed in the Japanese Utility Model Publication No. 52-15639.

In the conventional floor hinge of the type including the mechanical back check mechanism, it is difficult to minutely adjust the back check function.

On the other hand, in the conventional floor hinge of the type utilizing the hydraulic circuit means, it may be possible to adjust or control the first and second door closing speeds, the back check function, the delayed action and the latching action. However, some floor hinges of this type include no mechanism for minutely adjusting these functions or actions, or other some floor hinges of this type include mechanisms capable of minutely adjusting these functions or actions but have complicated structures for attaining these functions or actions or involve troublesome adjusting workings, involving much time and cost and, hence, being not practical.

SUMMARY OF THE INVENTION

An object of the present invention is to substantially eliminate the defects or drawbacks encountered to the prior art described above and to provide a hydraulic control system of a floor hinge including a hydraulic circuit means for easily and minutely achieving various functions such as first and second door speed adjusting functions, back check function in suitable combination thereof to thereby attain the ideal door opening and closing action.

This and other objects can be achieved according to the present invention by providing a hydraulic control system of a floor hinge provided with a hinge case in which is formed a cylinder portion in which a piston is linearly displaced by a door opening action against an urging force of a return spring, the cylinder portion being sectioned into piston front and rear chambers by the location of the piston, and the door is then automatically closed by the accumulated returning force of the spring, characterized in that a first oil passage is disposed on a side wall of the cylinder portion so as to communicate with the piston front and rear chambers, a first check valve is disposed in the first oil passage and acts to move a hydraulic oil in the piston rear chamber into the piston front chamber by a door opening action due to the displacement of the piston, a second oil passage is disposed on the side wall of the cylinder portion, a second check valve is disposed in the second oil passage and acts in a manner reverse to that of the first check valve, a back check adjusting valve is disposed in the first oil passage so as to adjust quantity of displacement of the hydraulic oil from the piston rear chamber to the piston front chamber in a door open angle region ranged from a predetermined door open angle position to a door fully open angle position, a first speed adjusting valve is disposed in the second oil passage so as to adjust the quantity of displacement of the hydraulic oil from the piston front chamber to the piston rear chamber during the movement of the piston from a first door close angle position to a second door close angle position, and a second speed adjusting valve is disposed in the second oil passage so as to adjust quantity of displacement of the hydraulic oil from the piston front chamber to

the piston rear chamber during the displacement of the piston from the second door close angle position to a door fully close angle position.

In preferred embodiments according to the present invention, a latching action adjusting valve is disposed in the first oil passage for allowing the hydraulic oil to move from the piston front chamber to the piston rear chamber in the door closing region at a time when the piston displaces from the predetermined door open angle position just before the door closing position to the door fully closed position and for adjusting the quantity of the displacement of the hydraulic oil.

A delayed action adjusting valve is disposed in the second oil passage for adjusting the quantity of the displacement of the hydraulic oil moved from the piston front chamber to the piston rear chamber in the door closing region at a time when the piston displaces from the door fully open angle position to the first door close angle position.

The latching action adjusting valve and the delayed action adjusting valve may be incorporated commonly in the hydraulic circuit means in addition to the back check adjusting valve and the first and second speed adjusting valves.

According to the hydraulic control system of the floor hinge of the characters described above, in response to the door opening action, the piston moves linearly towards the piston front chamber while compressing the return spring and, the door is opened to a position of a predetermined open angle.

In a case where the door is opened from the fully closed position (0°) to a predetermined open angle position (70°, for example), the hydraulic oil filled up in the piston rear chamber freely moves into the piston front chamber through the first oil passage and the check valve. At this moment, the check valve in the second oil passage is closed by the hydraulic oil, so that the hydraulic oil does not move into the second oil passage.

Next, in a case where the door is opened to the fully open angle position from the predetermined open angle position (70°, for example), the hydraulic oil in the piston rear chamber moves into the piston front chamber through the back check adjusting valve in the first oil passage and the check valve. At this moment, the quantity of the displacement of the hydraulic oil can be minutely adjusted by the back check valve arranged in the first oil passage, whereby an accidental rapid door opening which may be caused by a strong wind or external force can be restricted.

In a case where the door is closed from the door fully open angle position to the predetermined door close angle position (70°, for example) the hydraulic oil in the piston front chamber moves into the piston rear chamber through the second oil passage while opening the check valve. At this moment, the quantity of the displaced hydraulic oil is adjusted by the first and second speed adjusting valves disposed in the second oil passage. In this operation, in a case where the delayed action adjusting valve is further disposed in the second oil passage, the hydraulic oil in the piston front chamber moves into the piston rear chamber through the first and second speed adjusting valves and the delayed action adjusting valve while opening the check valve. At this moment, the quantity of the displaced hydraulic oil can be minutely adjusted by the first and second speed adjusting valves and the delayed action adjusting valve disposed in the second oil passage. The hydraulic oil in the piston front chamber flows in the intermediate portion of the first oil passage, but the check valve in the first oil passage is closed by the hydraulic oil, so that the hydraulic oil does not flow into the piston rear chamber through the first oil passage.

Next, in a case where the door is closed in the first door close speed range from the predetermined close angle position (70°, for example) to an open angle close to a position where the door is completely closed, the hydraulic oil in the piston front chamber moves into the piston rear chamber through the first and second speed adjusting valves at a time when the oil passage in which the first speed adjusting valve of the second oil passage is disposed is closed at the piston seal surface. At this moment, the quantity of the displaced hydraulic oil is minutely adjusted by the speed adjusting valve disposed in one of opened oil passages in two branched oil passages of the second oil passage in which the first and second speed adjusting valves are disposed. However, in an ordinal operation, the first speed is preset to be faster than the second speed, the quantity of the displaced hydraulic oil can be minutely adjusted by the first speed adjusting valve in the first speed region.

When the door is closed in the second speed region, the hydraulic oil in the piston front chamber moves into the piston rear chamber through the second oil passage and the second speed adjusting valve. At this moment, the quantity of the displaced hydraulic oil can be minutely adjusted by the second speed adjusting valve.

In addition, in a case where the latching action adjusting valve is disposed in the first oil passage, the hydraulic oil in the piston front chamber moves into the piston rear chamber through the first oil passage and the latching action adjusting valve by opening a portion of the oil passage at which the latching action adjusting valve is disposed at the piston seal surface. Accordingly, the door closing speed is made speed-up just before the door closing, thus surely closing the door.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention and to show how the same is carried out in effect, reference is now made, by way of preferred embodiments, to the accompanying drawings, in which:

Fig. 1 is a longitudinal section of a first embodiment of a floor hinge according to the present invention;

Fig. 2 is an elevational section of the floor hinge shown in Fig. 1;

Figs. 3, 4, 5, 6, 7 and 8 are sectional views taken along the lines III-III, IV-IV, V-V, VI-VI, VII-VII, and VIII-VIII shown in Fig. 1, respectively;

Fig. 9 is a longitudinal section showing a part of a second embodiment of a floor hinge according to the present invention;

Figs. 10 and 11 are sectional view taken along the lines X-X and XI-XI shown in Fig. 9;

Fig. 12 is a longitudinal section showing a part of the third embodiment of a floor hinge according to the present invention;

Fig. 15 is a cross section of a part of the fourth embodiment of a floor hinge according to the present invention;

Figs. 16 and 17 are sectional views taken along the lines XVI-XVI and XVII-XVII shown in Fig. 15; and

Fig. 18 is a view representing the relationship between the door opening angles and the respective functions of the hydraulic adjusting system of the floor hinge in the door opening and closing region.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

First Embodiment

Figs. 1 to 8 represent a first embodiment of a floor hinge according to the present invention provided with a first and a second speed mechanisms for controlling door closing speed and a back check mechanism for opening a door slowly.

Figs. 1 and 2 show longitudinal section and elevational section of the whole structure of the floor hinge, in which the floor hinge is provided with a hinge case 8 as a hinge body having a cylinder portion 9 formed at the righthand end as viewed.

The cylinder portion 9 of the hinge case 8 has one open end which is closed by a plug 12 and the other end which is liquid- tightly closed but provided with an opening 8a at the upper portion of the closed end which is liquid tightly closed by a lid 29. In such a structure, the interior of the cylinder portion 9 is divided into a piston rear chamber A located leftside a piston 7 and a piston front chamber B located rightside the piston 7.

In the piston rear chamber A, a main shaft 1 is supported by a bottom of the hinge case 8 and the lid 29 through bearings 31 and 31 to be rotatable with one end of the shaft 1 extending outwardly. A cam 32 of approximately a heart shape is secured to the main shaft 1. In addition, in the piston rear chamber A, a pair of sliding plates 3 and 3 are arranged with the cam 32 vertically sandwiched therebetween, and three rollers 2, 2′ and 2″ are journaled between the sliding plates 3 and 3.

A connecting rod 5 is connected at one end thereof to one ends of the sliding plates 3 and 3 by means of screws 4 and 4, and the other end of the connecting rod 5 extending towards the cylinder portion 9 is connected to the piston 7 in the cylinder portion 9 through a piston pin 6.

A return spring 11 for urging a door 30 in a door closing direction is disposed between a spring shoe 33 arranged at substantially the longitudinally intermediate portion of the rear chamber A and the end face of the piston 7.

Hydraulic oils 10 and 10′ are filled up in the piston rear chamber A and the piston front chamber B.

The cylinder portion 9 is provided with a side wall 9a to which a first oil passage 34 and a second oil passage 35 are independently formed so as to communicate with the rear chamber A and the front chamber B, respectively, as shown in Fig. 1 and Figs. 3 to 8.

The first oil passage 34 has one end, as shown in Figs. 1 and 4, at which a front oil passage 17 and an intermediate oil passage 13 are formed with a predetermined space in the moving direction of the piston 7 in the cylinder portion 9 so as to communicate with the rear chamber A. The other end of the first oil passage 34 communicates with the front chamber B through an oil passage 15.

As shown in Figs. 4 and 8, on the side of the front oil passage 17 of the first oil passage 34 is located a back check adjusting valve 18 so as to minutely adjust an oil passing amount. A check valve 14 is arranged between the intermediate oil passage 13 and the oil passage 15 in the first oil passage 34 as shown in Fig.s 1 and 4. As shown in Fig. 4, the check valve 14 is composed of a valve seat 14a formed in the first oil passage 34 and a ball member 14b and a screw-type lid 14d is screw-engaged with an opening 34a of the first oil passage 34 in a liquid-tight manner so as to prevent the ball member 14b from being removed.

The check valve 14 acts so that the hydraulic oil 10 in the rear chamber A freely flows into the

front chamber B through the first oil passage 34 when the door is opened and the hydraulic oil 10′ in the front chamber B does not flow into the rear chamber A when the door is closed.

On the other hand, as shown in Figs. 1 and 3, the second oil passage 35 has one end communicating with the piston rear chamber A through an oil passage 25 and the other end communicating with the piston front chamber B through a front oil passage 19 and a rear oil passage 20 formed with a predetermined space in the moving direction of the piston 7.

As shown in Fig. 3, on the side of the front oil passage 25 of the rear chamber A of the second oil passage 35 is located a check valve 23, which acts so that hydraulic oil 10′ in the front chamber B freely flows into the rear chamber A through the second oil passage 35 when the door is closed and the hydraulic oil 10 in the rear chamber A does not flow into the front chamber B when the door is opened. The check valve 23 is composed of a valve seat 23a and a ball member 23b.

A first speed adjusting valve 21 and a second speed adjusting valve 22 are disposed close to the front and rear oil passages 19 and 20 on the side of the front chamber B of the second oil passage 35, as shown in Figs. 3, 5 and 6, so as to minutely adjust the oil passing amount.

Second Embodiment

Figs. 9 to 11 represent a part of the floor hinge according to a second embodiment of the present invention which is provided with mechanisms for attaining the latching action function for increase the door closing speed just before the door is completely closed in addition to the first and second speed functions and the back check function.

Referring to Figs. 9 to 11, the first oil passage 34 has one end to which a front oil passage 17, an intermediate oil passage 13, and a rear oil passage 28 are formed with predetermined spaces in the moving direction of the piston 7 so as to communicate with the piston rear chamber A. A back check adjusting valve 18 and a latching action adjusting valve 27 are disposed on the side of the front oil passage 17 and on the side of the rear oil passage 28, respectively, so that the oil passing amount can be adjusted. In this arrangement, a check valve 14 is further located between the intermediate oil passage 13 and the rear oil passage 28 in the first oil passage 34. The check valve 14 of the second embodiment acts in substantially the same manner as that described with reference to the first embodiment, but in the second embodiment, a press pin 14c is incorporated in the first oil passage 34 so as to hold a ball member 14b of the check valve 14 at a predetermined portion in a floating manner so as not to disturb the smooth flow of the hydraulic oil 10.

The other construction of the floor hinge of the second embodiment is substantially the same as that of the first embodiment, so that the detail thereof is now omitted herein.

Third Embodiment

Figs. 12 and 13 represent a part of the floor hinge according to a third embodiment of the present invention which is provided with mechanisms for attaining the delayed action function for decreasing the door closing speed in addition to the first and second speed functions and the back-check function.

Referring to Figs. 12 and 13, a front oil passage 25 and a rear oil passage 26 are formed on the side of the rear chamber A of the second oil passage 35 in place of the rear oil passage 28 of the second embodiment. In addition, a delayed action adjusting valve 24 is further located on the side of the front oil passage 25, as shown in Fig. 13, so as to minutely adjust the oil passing amount.

The other construction of the floor hinge of the third embodiment is substantially the same as that of the first embodiment, so that the detail thereof is now omitted herein.

Fourth Embodiment

Figs. 15 to 17 represent a part of the floor hinge according to a fourth embodiment of the present invention which is provided with mechanisms for attaining the delayed action function and the latching action function as well as the first and second speed functions and the back check function.

Referring to Figs. 15 and 17, a front oil passage 17, an intermediate oil passage 13, and a rear oil passage 28 are respectively formed on the side of the front chamber A of the piston 7 in the first oil passage 34. A back check adjusting valve 18 is located on the side of the front oil passage 17 and a ratching action adjusting valve 27 is further located on the side of the rear oil passage 28, respectively.

On the side of the rear chamber A in the second oil passage 35 are respectively formed front and rear oil passage 25 and 26, and on the side of the front oil passage 25 are arranged a check valve 23 and a delayed action adjusting valve 24. The check valve 23 acts in substantially the same manner as that described with reference to the first embodiment.

The other construction of the floor hinge of the fourth embodiment is substantially the same as that of the first embodiment, so that the detail thereof is now omitted herein.

The embodiments of the floor hinges of the constructions described above according to the present invention will operate in the manner described hereunder.

Figs. 1 and 2 show the closed state of the door 30, and the lower end of the door 30 is fixed to the main shaft 1 of the floor hinge through an arm member and the like, not shown. As illustrated, the piston 7 is held in a position where the piston 7 is moved on the side of the front chamber B by the return spring 11, and the rollers 2 and 2′ contact to minimum diameter portions of the cam 32.

Now supposing that the door 30 is opened counterclockwisely as shown in Fig. 18, the main shaft 1 of the floor hinge is rotated in the counterclockwisely as viewed in Fig. 1 together with the cam 32, so that the sliding plates 3 are moved leftwardly as viewed through the rollers 2 and 2′ abutting against the cam 32. Accordingly, the piston 7 moves linearly towards the side of the rear chamber A while compressing the return spring 11 through the connection rod 5, whereby the piston returning force, i.e. door closing force, is accumulated in the return spring 11.

Referring to Fig. 18, it is supposed that the opened angle of the door is to be 120° in which the door opening and closing angle ranged from 70° to 120° is referred to as back check region (BC region), the angle ranged from 120° to 70° is referred to as delayed action region (DA region), the angle ranged from 70° to 20° is referred to as first speed region, the angle ranged from 20° to 0° is referred to as second speed region and the angle ranged from 5° to 0° is referred to as latching action region (LA region).

In this supposition, when the door 30 shown in Fig. 18 is opened counterclockwisely by angles from 0° to 70° with a hang base 0 being the center of the rotation of the door 30, the hydraulic oil 10 in the rear chamber A shown in Fig. 1 or 2 freely flows into the front chamber B through, as shown in Figs. 1, 4 and 7, the intermediate oil passage 13, the first oil passage 34, the check valve 14 and the oil passage 15.

When the door 30 is opened with the angle of the BC region in Fig. 18, the intermediate oil passage 13 is closed with a piston seal surface 16, so that the hydraulic oil 10 in the rear chamber A moves into the front chamber B through the front oil passage 17 of the first oil passage 34, the check valve 14 and the oil passage 15. At this moment, the door 30 is subjected to the back check function because of the location of the back check adjusting valve 18 on the side of the front oil passage 17 of the first oil passage 34.

The quantity of the displaced hydraulic oil 10 at this moment is minutely adjusted by the back check adjusting valve 18, so that the rapid opening of the door due to strong wind or strong external force, for example, can be restricted.

When the door 30 is closed from the fully opened condition, the check valve 14 in the first oil passage 34 is closed by means of the hydraulic oil 10′ in the front chamber B and, hence, the hydraulic oil 10′ in the front chamber B passes the second oil passage 35 without passing the first oil passage 34. Namely, the hydraulic oil 10′ in the front chamber B flows into the rear chamber A through the front oil passage 19, the rear oil passage 20 in the second oil passage 35, the check valve 23, and the front oil passage 25. At this moment, the quantity of the displaced hydraulic oil 10′ can be minutely adjusted by the first speed adjusting valve 21 and the second speed adjusting valve 22 disposed in the second oil passage 35. That is, when the door is closed, the door is closed at a first speed in the region from 70° to 20° by controlling the first and second speed adjusting valves 21, 22 and then closed at a second speed in the region from 20° to 5° by controlling the second speed adjusting valve 22.

In a case where the floor hinge is provided with the latching function as described with reference to the second embodiment shown in Figs. 9 to 11, the hydraulic oil 10′ in the front chamber B flows into the rear chamber A through the oil passage 15, latching action adjusting valve 27 and the rear oil passage 28 in the first oil passage 34 in addition to the second oil passage 35 when the door is closed to its complete close position. Accordingly, when the door 30 is closed with door closing angles ranged in the LA region in Fig. 18, the rear oil passage 28 is opened from the seal surface 16a of the piston 7 and the door closing speed is increased and, hence, the door 30 can be surely closed.

In a case where the floor hinge is provided with the delayed action function as described with reference to the third embodiment shown in Figs. 12 to 14, when the door 30 is closed from the door fully opened state with door closing angles ranged in the DA region, the hydraulic oil 10′ in the front chamber B flows into the rear chamber A through the front oil passage 19, the rear oil passage 20, the first speed adjusting valve 21, the second speed adjusting valve 22, the check valve 23, the delayed action adjusting valve 24, and the front oil passage 25, all disposed in the second oil passage 35, as shown in Figs. 12 and 13.

At this moment, in the DA region, the quantity of the displaced hydraulic oil 10′ can be minutely adjusted by the first speed adjusting valve 21, the

second speed adjustirig valve 22 and the delayed action adjusting valve 24. In this operation, however, in a case where the opening degree of the delayed action adjusting valve 24 is wider than those of the first and second speed adjusting valves 21 and 22, i.e. where the delayed action function is not attained, the quantity of the hydraulic oil 10' can be minutely adjusted by the first speed adjusting valve 21. The door opening angle region which can be adjusted by the first speed adjusting valve 21 is from 120° to 20° shown in Fig. 18. When the door is closed to a position of 70°, the front oil passage 26 is opened with the delayed action adjusting valve 24 being in a non operational condition.

With reference to the fourth embodiment of the floor hinge shown in Figs. 15 to 17, the operation will be carried out in a manner totally combined by those described above with reference to the first, second, and third embodiments and, accordingly, the detail of the operation of the fourth embodiment is omitted herein.

According to the respective embodiments of the present invention, the ideal door opening and closing action can be achieved in suitable combination of the respective functions of the hydraulic circuit means of the hydraulic control system of the floor hinge.

Claims

1. A hydraulic control system of a floor hinge provided with a hinge case (8) in which is formed a cylinder portion (9) in which a piston (7) is linearly moved by a door opening action against an urging force of a return spring (11), the cylinder portion (9) being sectioned into a piston front chamber (B) and a piston rear chamber (A) by the location of the piston (7), and the door (30) is then automatically closed by accumulated returning force of the spring (11), characterized in that a first oil passage (34) is disposed on a side wall (9a) of the cylinder portion (9) so as to communicate with the piston front and rear chambers (B, A), a first check valve (14) is disposed in the first oil passage (34) and acts to move a hydraulic oil in the piston rear chamber (A) into the piston front chamber (B) by a door opening action due to the movement of the piston (9), a second oil passage (35) is disposed on the side wall (9a) of the cylinder portion (9), a second check valve (23) is disposed in the second oil passage (35) and acts in a manner reverse to that of the first check valve (14), a back check adjusting valve (18) is disposed in the first oil passage (34) so as to adjust quantity of displacement of the hydraulic oil from the piston rear chamber (A) to the piston front chamber (B) in a door open angle region ranged from a predetermined door open angle position to a door fully open angle position, a first speed adjusting valve (21) is disposed in the second oil passage (35) so as to adjust the quantity of the displacement of the hydraulic oil from the piston front chamber (B) to the piston rear chamber (A) during the movement of the piston (7) from a first door close angle portion to a second door close angle position, and a second speed adjusting valve (22) is disposed in the second oil passage (35) so as to adjust the quantity of the displacement of the hydraulic oil from the piston front chamber (B) to the piston rear chamber (A) during the movement of the piston (7) from a second door close angle position to a door almost close angle position.

2. A hydraulic control system according to claim 1, wherein a latching action adjusting valve (27) is disposed in the first oil passage (34) for causing the hydraulic oil to move from the piston front chamber (B) to the piston rear chamber (A) in the door closing region at a time when the piston (7) moves from the predetermined door open angle position just before the door closing position to the door fully closed position and for adjusting the quantity of the displacement of the hydraulic oil.

3. A hydraulic control system according to claim 1, wherein a delayed action adjusting valve (24) is disposed in the second oil passage (35) for adjusting the quantity of the displacement of the hydraulic oil moved from the piston front chamber (B) to the piston rear chamber (A) in the door closing region at a time when the piston moves from the door fully open angle position to the predetermined door close angle position.

4. A hydraulic control system according to claim 1, wherein a latching action adjusting valve (27) is disposed in the first oil passage (34) for adjusting the quantity of the displacement of the hydraulic oil from the piston front chamber (A) to the piston rear chamber (B) in the door closing region at a time when the piston (7) moves from the predetermined door open angle position just before the door closing to the door fully closed position and a delayed action adjusting valve (24) is disposed in the second oil passage (35) for adjusting the quantity of the displacement of the hydraulic oil moved from the piston front chamber (A) to the piston rear chamber (B) in the door closing region at a time when the piston (7) moves from the door fully open angle position to a predetermined door closing position.

FIG. 1

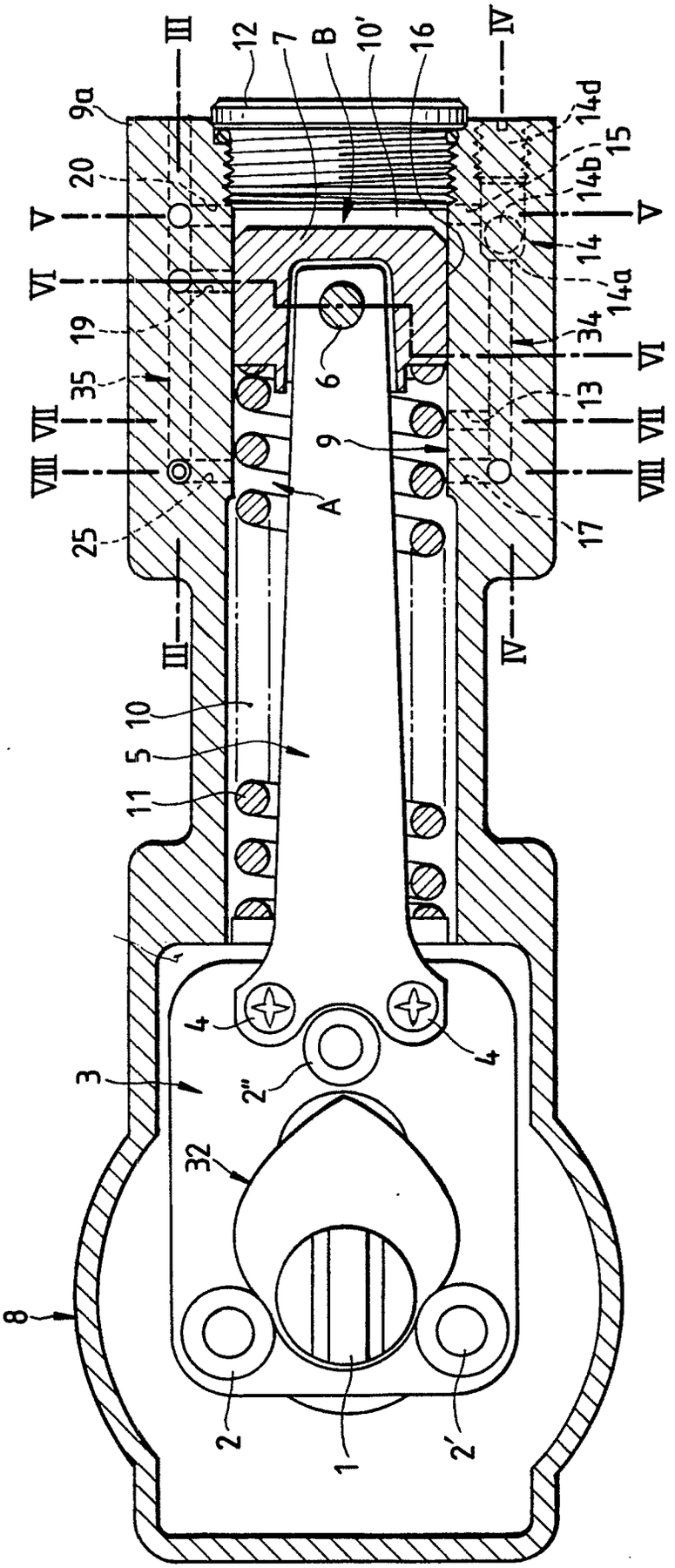

III
12
7
B
10'
16
IV
9a
14d
15
20
V
14b
V
14
VI
14a
34
19
6
VI
35
13
VII
9
VII
VIII
A
VIII
25
17
III
IV
10
5
11
4
4
4
3
2"
32
8
2
1
2'

FIG. 2

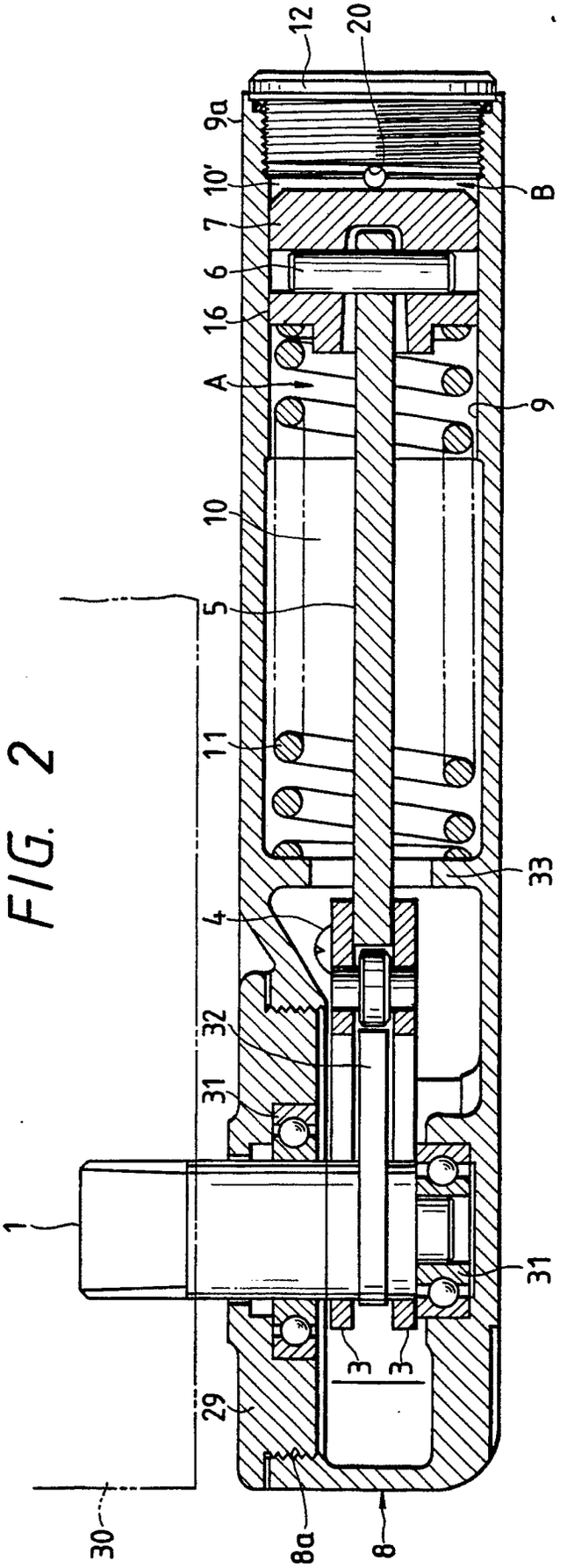


FIG. 4

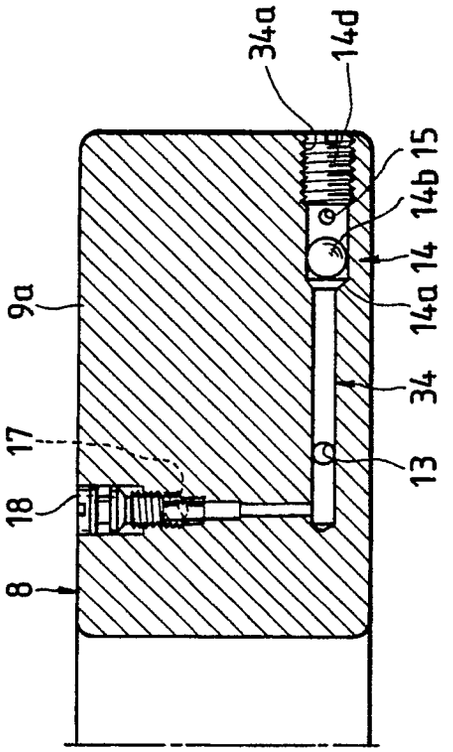


FIG. 3

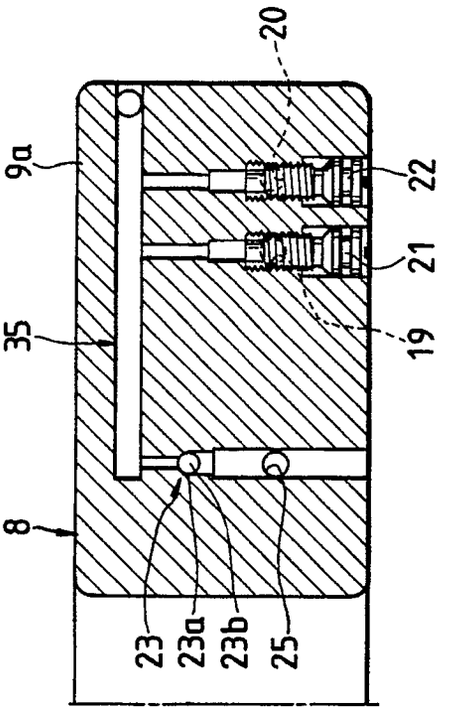


FIG. 5

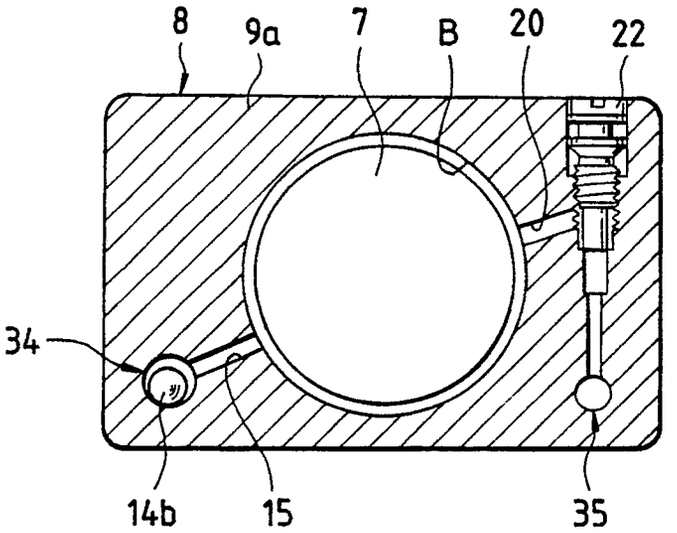


FIG. 6

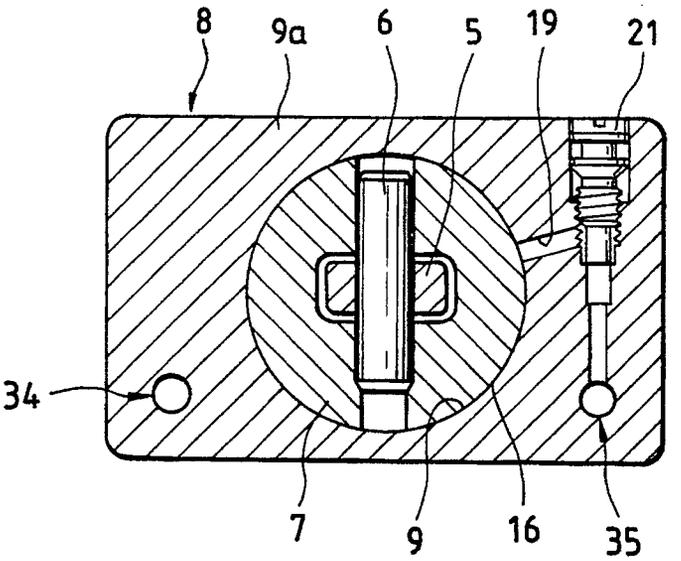


FIG. 7

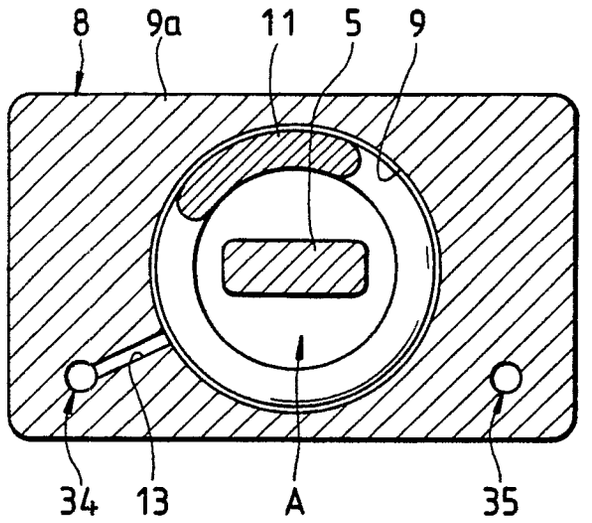


FIG. 8

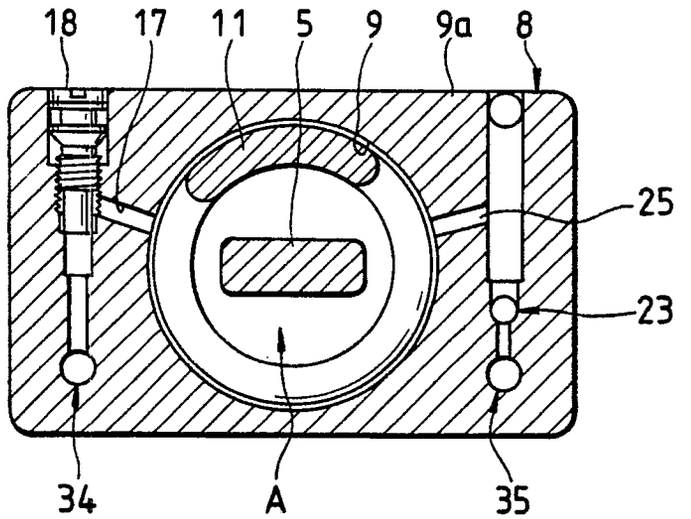


FIG. 9

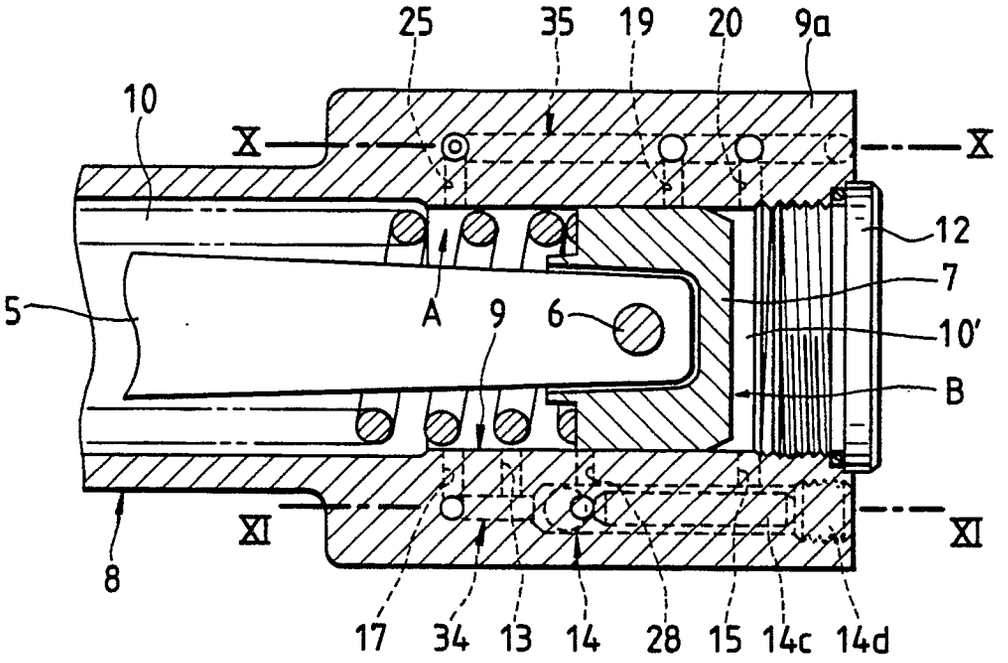

25
35
19
20
9a
10
X
X
12
7
5
A
9
6
10'
B
XI
XI
8
17
34
13
14
28
15
14c
14d

FIG. 10

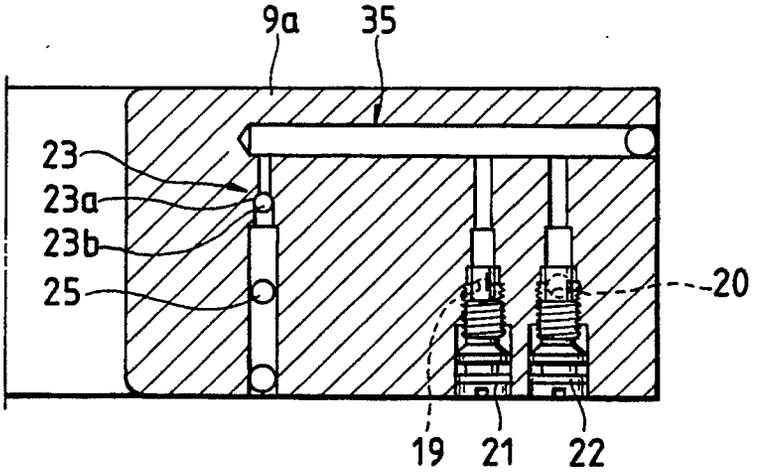

9a
35
23
23a
23b
25
20
19
21
22

FIG. 11

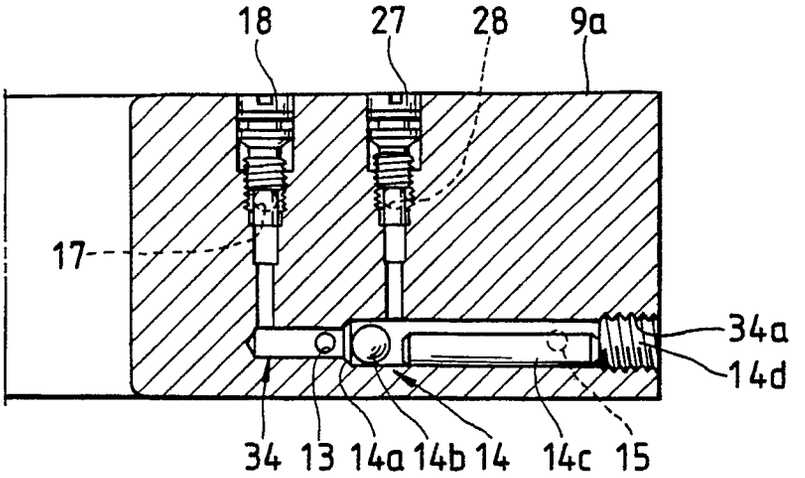

18
27
28
9a
17
34a
14d
34
13
14a
14b
14
14c
15

FIG. 12

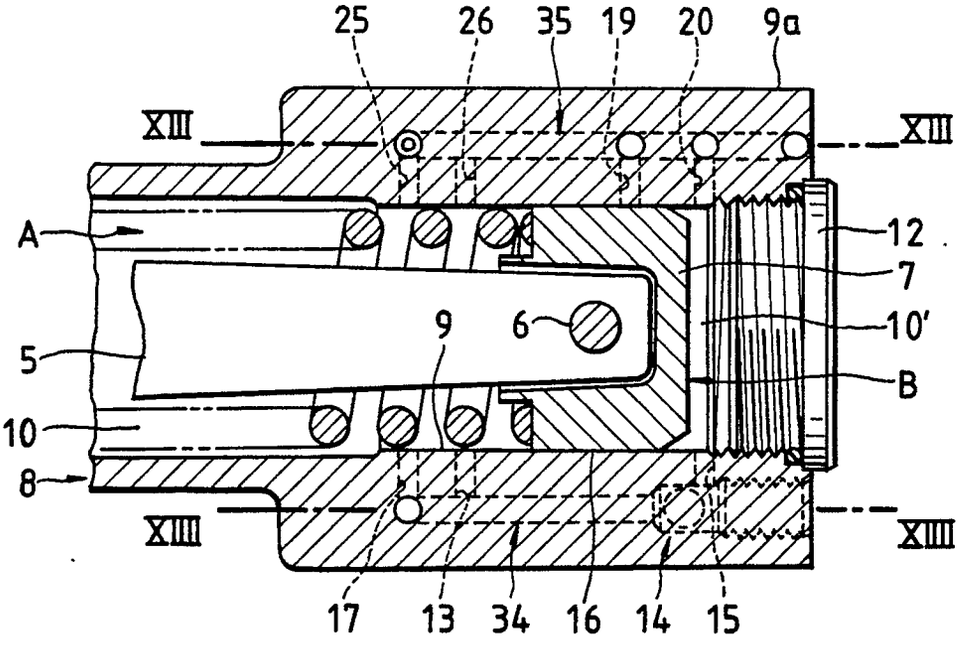

25
26
35
19
20
9a
XIII
XIII
A
12
7
9
6
10'
5
B
10
8
XIII
XIII
17
13
34
16
14
15

FIG. 13

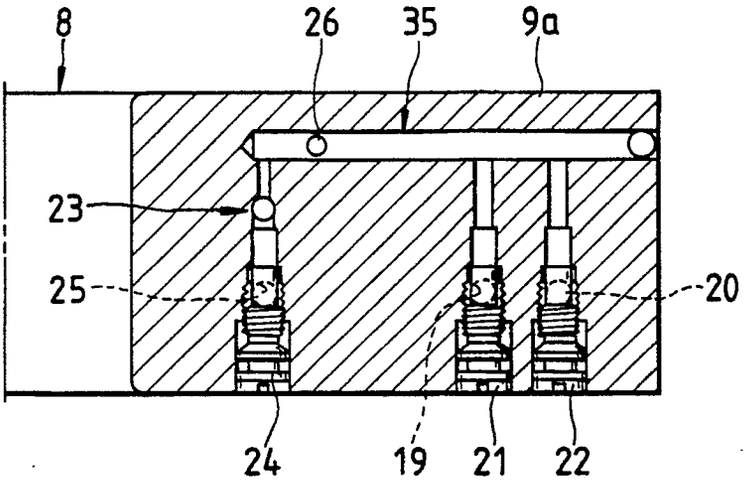


FIG. 14

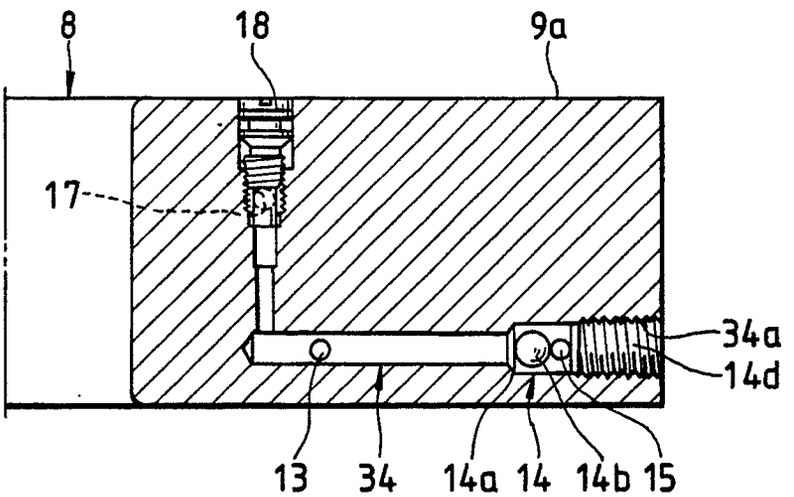


FIG. 15

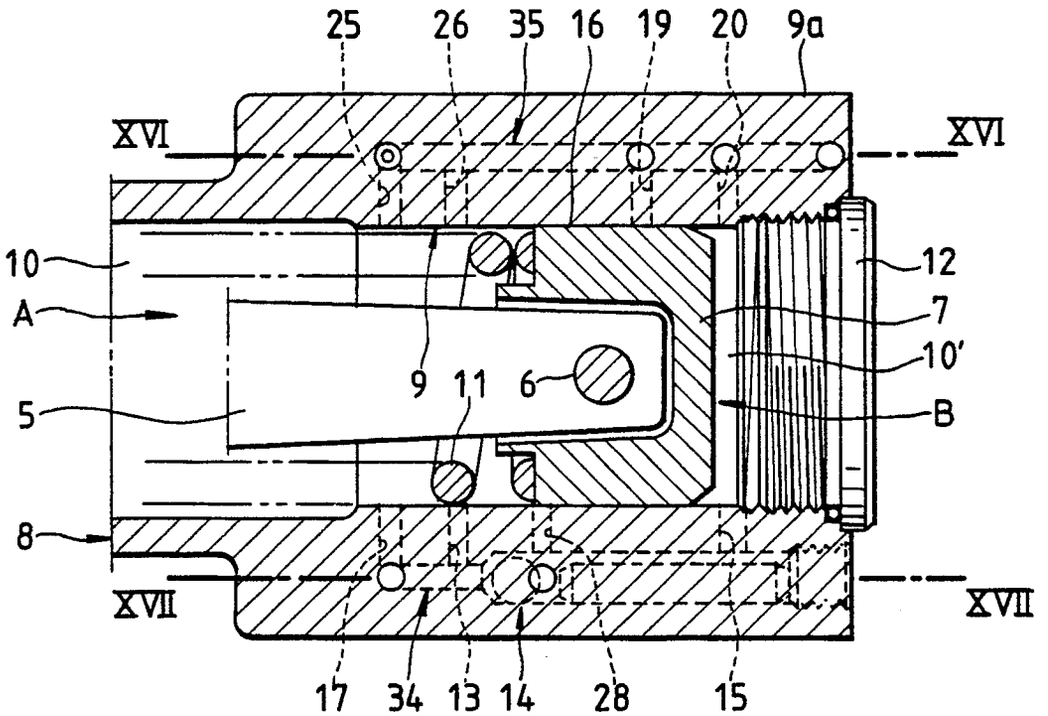

25
26
35
16
19
20
9a
XVI
XVI
10
A
5
8
XVII
XVII
12
7
10'
B
9
11
6
17
34
13
14
28
15

FIG. 16

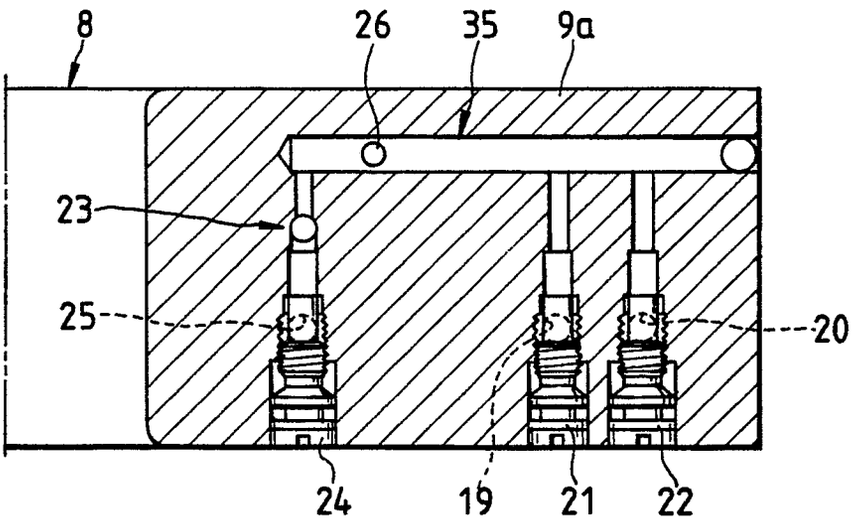

8
26
35
9a
23
25
20
24
19
21
22

FIG. 17

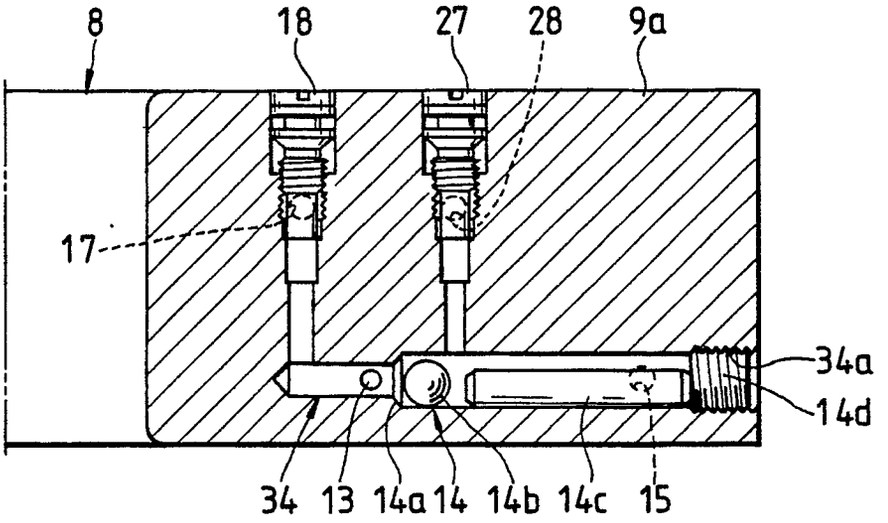
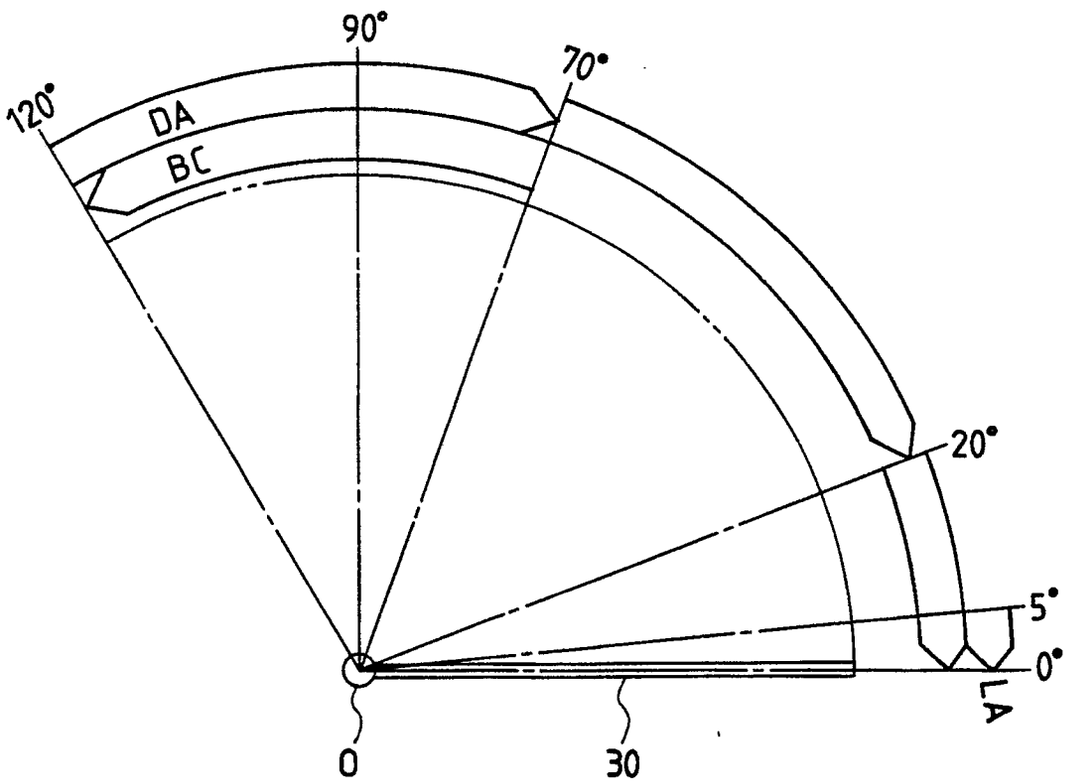

8
18
27
28
9a
17
34a
14d
34
13
14a
14
14b
14c
15

FIG. 18


90°
70°
120°
DA
BC
20°
5°
0°
LA
0
30

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 30 7272

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)
X	US-A-3605339 (CATLETT) * column 4, line 61 - column 5, line 68; figure 9 *	1	E05F3/12 E05F3/10
Y		3	
A	US-A-3042957 (MUESSEL) * column 1, lines 16 - 30 * * column 6, lines 40 - 65 * * column 7, line 24 - column 8, line 16; figures 1-7 *	1, 2, 4	
A	US-A-3059268 (MC HALE) * column 4, line 68 - column 5, line 26; figure 8 *	2	
Y	US-A-4378612 (BEERS) * column 3, line 37 - column 4, line 17; figure 4 *	3	
A		4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 SEPTEMBER 1990	GUILLAUME G.E.P.

CATEGORY OF CITED DOCUMENTS

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L : document cited for other reasons

& : member of the same patent family, corresponding document

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