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(54) A barrier

(57) A barrier (1) has a base unit (2) which is secured to the ground and a top unit (3) which may be connected at any one of four different orientations. An electronic controller (6) is mounted in a door (5) of the base unit (2) so that is may be easily accessed. A drive mechanism (35) is mounted in a modular manner in the top unit (3). It is mounted by virtue of a beam drive shaft (21) which is mounted by bearings (22) at each end to opposed side walls (20) of the top unit (3). The beam is connected to the drive shaft (21) in a symmetrical manner so that the barrier may be used for either the right side or the left side of a laneway. There is excellent support and balance in the drive mechanism because it is connected between support bearings of the beam drive shaft (21). A manual override is provided to release a clutch if an electrical fault arises. The beam has a shear plate (27) which yields to minimise damage to either the drive mechanism or a beam arm (30) in the event of an accidental impact against the beam.

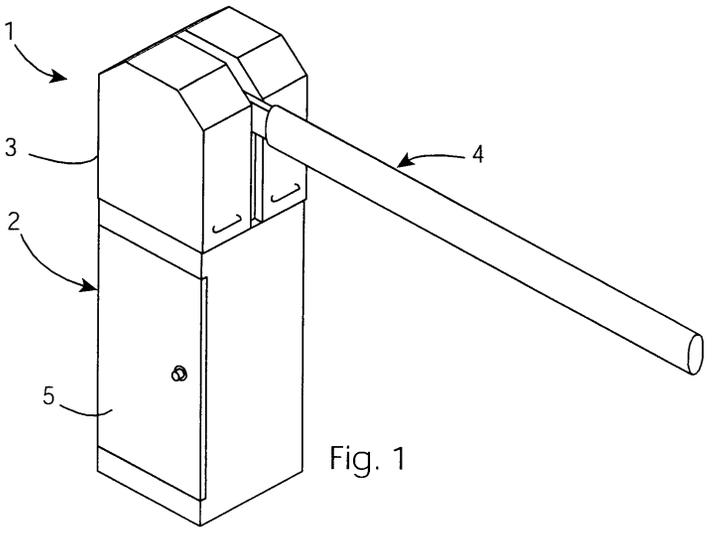

Fig. 1

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Description

[0001] The invention relates to a barrier of the type comprising a beam and a drive mechanism for causing movement of the beam in a vertical plane between a lower closed position and an upper open position.

[0002] Heretofore, such barriers have required extensive maintenance because the bearings and other parts of the drive mechanism become excessively worn and are easily damaged in the harsh environments in which they are often installed. Another problem is that the barriers are designed for one side of a lane only, with a clear housing being presented to the driver approaching the barrier and parts of the drive mechanism which are unsightly are hidden at the far side of the mechanism. Thus, installation and maintenance companies need to carry both left and right side stock parts in order to provide a comprehensive maintenance/installation service.

[0003] The invention is directed towards providing a barrier which is more robust than heretofore, and which is more versatile in the manner in which it is installed.

[0004] Another object is to provide for dealing with physical damage or electrical problems in a simpler manner.

[0005] According to the invention, there is provided a barrier comprising a beam, a drive mechanism for causing movement of the beam between a lower closed position and an upper open position in a vertical plane, and a housing, characterised in that, the beam and the drive mechanism are connected to a beam drive shaft, and said beam drive shaft is mounted on the housing by at least two spaced-apart bearings.

[0006] Because the beam and the drive mechanism are connected to a drive shaft which is mounted on the housing by at least two spaced-apart bearings, there is excellent balance in the various drive parts.

[0007] In another embodiment, the beam and the drive mechanism are connected to the beam drive shaft between the bearings. This provides excellent balance and allows the barrier to be used for either the right or left side of a laneway.

[0008] In one embodiment, the beam is connected to the beam drive shaft at a position approximately midway between the bearings. This provides a completely symmetrical arrangement.

[0009] In another embodiment, the beam comprises a connector secured to the beam drive shaft, a beam arm, and a shear coupling interconnecting the beam arm and the connector and comprising means for yielding or breaking before the beam arm or the connector with an impact against the beam. The shear coupling avoids the need for a beam or drive mechanism parts to be replaced and thus greatly simplifies and reduces the cost of repair if the barrier is struck by a vehicle.

[0010] In one embodiment, the connector comprises a pair of clamp plates and the shear coupling comprises a weakened plate clamped by the clamp plates on one side and supporting the beam arm on the other side. This is a very simple arrangement.

[0011] In one embodiment, the drive mechanism and the beam drive shaft are mounted on a top unit releasably secured to a ground-engaging base unit. This allows the drive mechanism to be lifted away in a very simple and modular manner.

[0012] Preferably, the top unit comprises means for being releasably secured to the base unit at any of four mutually orthogonal orientations. Thus, either the top or the base units of the housing may be orientated in any one of four directions to provide versatility for installation.

[0013] In one embodiment, the base unit comprise a door for access to the drive mechanism, and an electronic controller is mounted on said door. This allows very easy access to the electronic controller for a technician.

[0014] In another embodiment, the drive mechanism comprises a motor driving an output shaft, drive crank arm, a con rod connecting the drive crank arm to a driven crank secured to the beam drive shaft, and a counterbalance spring exerting counterbalancing bias on the beam drive shaft. This is a very compact, reliable, and robust drive mechanism.

[0015] In one embodiment, the motor is connected to the motor output shaft via a clutch pressure. This allows versatility in the weight of beam which is used.

[0016] In one embodiment, the drive mechanism further comprises a manual override mechanism having an externally-accessible actuator. Thus, if there is a fault in the motor, the beam may be either raised or lowered as desired with a simple manual override.

[0017] Preferably, said actuator comprises a coupler comprising means for sliding upon rotation of a spindle which is externally accessible.

[0018] The invention will be more clearly understood from the following description of some embodiments thereof, given by of example only with reference to the accompanying drawings in which:-

Fig. 1 is a perspective view from above of a barrier of the invention;

Fig. 2 is a perspective view from above of the barrier, but with a casing base unit at a different orientation for access to an electronic controller;

Fig. 3 is a perspective view from above of a base unit of the barrier;

Figs. 4(a) and 4(b) are plan views of the base unit and a top unit, respectively;

Fig. 5 is a front elevation view of the barrier with the top unit removed and the door of the base unit removed;

Fig. 6 is a perspective view from above of the top

unit, showing a drive mechanism of the barrier;

Figs. 7(a) and 7(b) are diagrammatic side views showing operation of a shear coupling of the beam;

Figs. 8(a) and 8(b) are diagrammatic side views showing operation of the drive mechanism in open and closed positions, respectively; and

Fig. 9 is a diagrammatic cross-sectional view showing a clutch assembly of the drive mechanism in detail.

[0019] Referring to the drawings, and initially to Figs. 1 to 4 there is shown a barrier 1 of the invention. The barrier 1 is for controlling vehicular access at car parks or at toll booths, for example.

[0020] The barrier 1 comprises a base unit 2 which is secured to the ground and supports a top unit 3. A beam 4 is connected to a drive mechanism within the top unit 3 in a symmetrical manner. The units 2 and 3 are square-shaped in plan and the top unit 3 is removably secured to the base unit 2 by bolts so that it may be installed at any one of four mutually orthogonal orientations. For example, a door 5 on the base unit 2 is shown at a side in the configuration in Fig. 1, whereas it is at the rear in the configuration of Fig. 2.

[0021] As shown in Fig. 3, the door 5 supports an electronic controller 6 for the drive mechanism and this provides very good access for maintenance and repair. Figs. 3 and 4 also illustrate a top flange 15 in the base unit 2. The top unit 3 supports a drive mechanism indicated generally by the numeral 35 in a modular bolt-on manner by bolting to the flange 15.

[0022] Referring also to the remaining drawings, the top unit 3 comprises a pair of spaced-apart walls 20 between which the drive mechanism 35 is supported. A beam drive shaft 21 is mounted across the walls 20 by bearings 22.

[0023] The beam 4 is connected to the beam drive shaft 21 via a shear coupling 25. The shear coupling 25 comprises a shear plate 27 having perforations 29 and which is clamped by a pair of opposed clamping plates 26 which are fast on the beam drive shaft 21. The shear plate perforations 29 provide a line of weakness. The shear plate 27 is in turn connected to a beam arm 30. This arrangement is shown most clearly in Figs. 7(a) and 7(b). As is clear from 7(b), if the beam 4 is accidentally struck by a vehicle the shear plate 27 breaks at the perforations 29. This prevents significant shear forces being transmitted back into the beam drive shaft 21. It also prevents in most cases damage to the beam arm 30. Repair is very simple because it is only necessary to replace the shear plate 27, making the necessary connections to the clamping plates 26 and to the beam arm 30.

[0024] The drive mechanism 35 is shown in detail in Fig. 6. It comprises a motor 40 having an integral reducing gearbox 41 which drives into a clutch assembly 42, which in turn drives a motor output shaft 43. A drive crank arm 44 is fast on the motor output shaft 43, and it is connected to a con-rod 45, in turn connected to a driven crank plate 46 which is fast on the beam drive shaft 21. A counter balance spring 47 is connected between the crank plate 46 and an anchorage on the base unit 2. This is a very simple and robust mechanism. The fact that the beam drive shaft 21 is mounted at both ends on the opposed walls 20 provides excellent support in a balanced manner. Also, the mechanism 35 is mounted in a modular manner which may be literally bolted onto the base unit 2. Thus, a maintenance crew may replace the drive mechanism 35 very easily. Also, because of the manner in which the beam is connected to the mechanism 35 the barrier 1 is symmetrical and so may be installed in either the left hand side or the right hand side of the laneway and there is no need for maintenance crew to hold duplicated left-side and right-side parts. This feature makes manufacture and installation much simpler because an order is not broken down into left-side and right-side parts. Another major advantage is the fact that the motor shaft 43/drive crank arm 44/con-rod 45/crank plate 46 is a very simple and robust drive train.

[0025] Operation of the drive mechanism 35 is shown in Figs. 8(a) and 8(b). In the open position shown in Fig. 8(a), the con-rod 45 is at its lowermost position, almost parallel to and along side the crank drive shaft 44. The motor 44 drives the output shaft 43 through approximately 180° until the crank drive arm 44 is directed upwardly and is in-line with the con-rod 45 which extends upwardly away from the drive crank arm 44. This brings the crank plate 46 to an upper position at which the beam drive 21 has been rotated to cause the beam 4 to be horizontal. These diagrams convey the simplicity of the drive mechanism and it will be appreciated that it is very robust, and even where a fault does occur it may be easily repaired.

[0026] The drive mechanism 35 provides excellent versatility for installation and it also allows manual override in the event of an electrical fault. Referring to Fig. 9, the clutch assembly 42 comprises conical clutch surfaces 60 which press against a worm wheel 61, which is in turn driven by a worm 62 connected to the motor output shaft 43.

[0027] The right hand clutch surfaces 60 as viewed in Fig. 9 are provided by a clutch sleeve 63 which is biased against the worm wheel 61 by a pair of spring washers 65. The washers 65 are retained by a nut 64 which is rotated at installation to set the required tension for the clutch. Also, the spring washers 65 act on the clutch sleeve 63 via an override plate 66 which is connected by a connector 67 to a sliding coupler 68 which slides through an aperture in a top unit wall. The sliding coupler 68 is internally threaded and an override bolt 69 engages these threads and axially engages the end of the beam drive shaft 21 via a ball bearing 70.

[0028] In operation, the spring washers 65 exert pressure on the clutch sleeve 23 to provide the clutch pressure. Thus, the clutch will slip in the event of an obstruction to the beam 4. However, in the event of an electrical fault, a manual override is provided. A maintenance technician simply uses an allen key from the outside to rotate the override bolt 69, thereby causing the sliding coupler 68 to pull the connector 67 to the right as viewed in Fig. 9, thereby pulling the override plane 66 to the right and releasing the clutch sleeve 63. The beam 4 may then be manually moved to the desired position.

[0029] It will be appreciated that the invention provides a barrier which is very robust, allows installation in a very versatile manner, and also allows repairs to be made in a quick and simple manner. These advantages are very important for this industry because of the harsh and often restricted nature of the environments in which the barrier is installed, and because of the requirement for repairs to be effected very quickly. A further major advantage is that the invention allows a barrier operator to improvise very easily if there is an electrical fault or power supply failure.

[0030] The invention is not limited to the embodiments described, but may varied in construction and detail. For example, the shear coupling may be of a material which yields instead of breaks.

Claims

1. A barrier comprising a beam, a drive mechanism for causing movement of the beam between a lower closed position and an upper open position in a vertical plane, and a housing, characterised in that, the beam (4) and the drive mechanism are connected to a beam drive shaft (21), and said beam drive shaft (21) is mounted on the housing by at least two spaced-apart bearings (22).

2. A barrier as claimed in claim 1, wherein the beam (4) and the drive mechanism (35) are connected to the beam drive shaft (21) between the bearings (22).

3. A barrier as claimed in claim 2, wherein the beam (4) is connected to the beam drive shaft (21) at a position approximately midway between the bearings (22).

4. A barrier as claimed in any preceding claim, wherein the beam (4) comprises a connector (26) secured to the beam drive shaft (21), a beam arm (30), and a shear coupling (25) interconnecting the beam arm (30) and the connector (26) and comprising means for yielding or breaking before the beam arm (30) or the connector with an impact against the beam (4).

5. A barrier as claimed in claim 4, wherein the connector comprises a pair of clamp plates (26) and the shear coupling comprises a weakened plate (27) clamped by the clamp plates (26) on one side and supporting the beam arm (30) on the other side.

6. A barrier as claimed in any preceding claim, wherein the drive mechanism (35) and the beam drive shaft (21) are mounted on a top unit (3) releasably secured to a ground-engaging base unit (2).

7. A barrier as claimed in claim 6, wherein the top unit (3) comprises means (15) for being releasably secured to the base housing unit (2) at any of four mutually orthogonal orientations.

8. A barrier as claimed in claim 6 or 7, wherein the base unit (2) comprises a door (10) and an electronic controller (11) is mounted on said door (10).

9. A barrier as claimed in any preceding claim, wherein the drive mechanism (35) comprises a motor (40) driving an output shaft (43), a drive crank arm (44), a con rod (45) connecting the drive crank arm (44) to a driven crank (46) secured to the beam drive shaft (21), and a counterbalance spring exerting counterbalancing bias on the beam drive shaft (21).

10. A barrier as claimed in claim 9, wherein the motor (40) is connected to the motor output shaft (43) via a clutch.

11. A barrier as claimed in claim 10, wherein the drive mechanism (35) further comprises a manual override mechanism (66-69) having an externally-accessible actuator (68).

12. A barrier as claimed in claim 11, wherein said actuator (68) comprises a coupler comprising means for sliding upon rotation of a spindle (69) which is externally accessible.

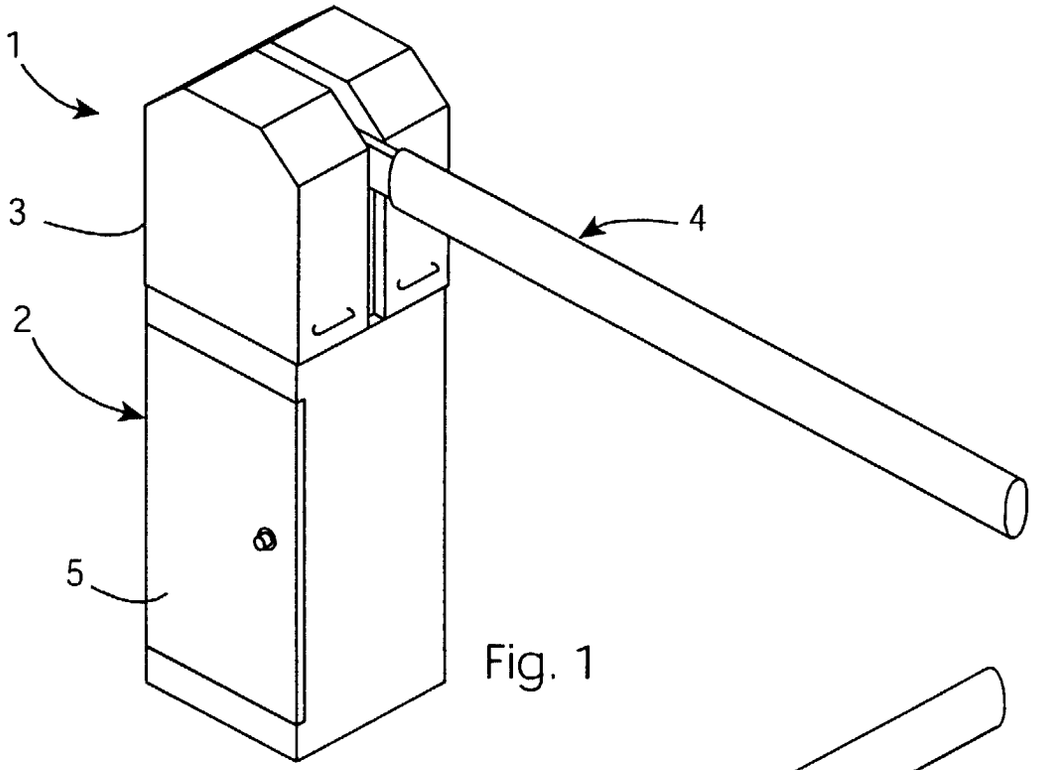

Fig. 1

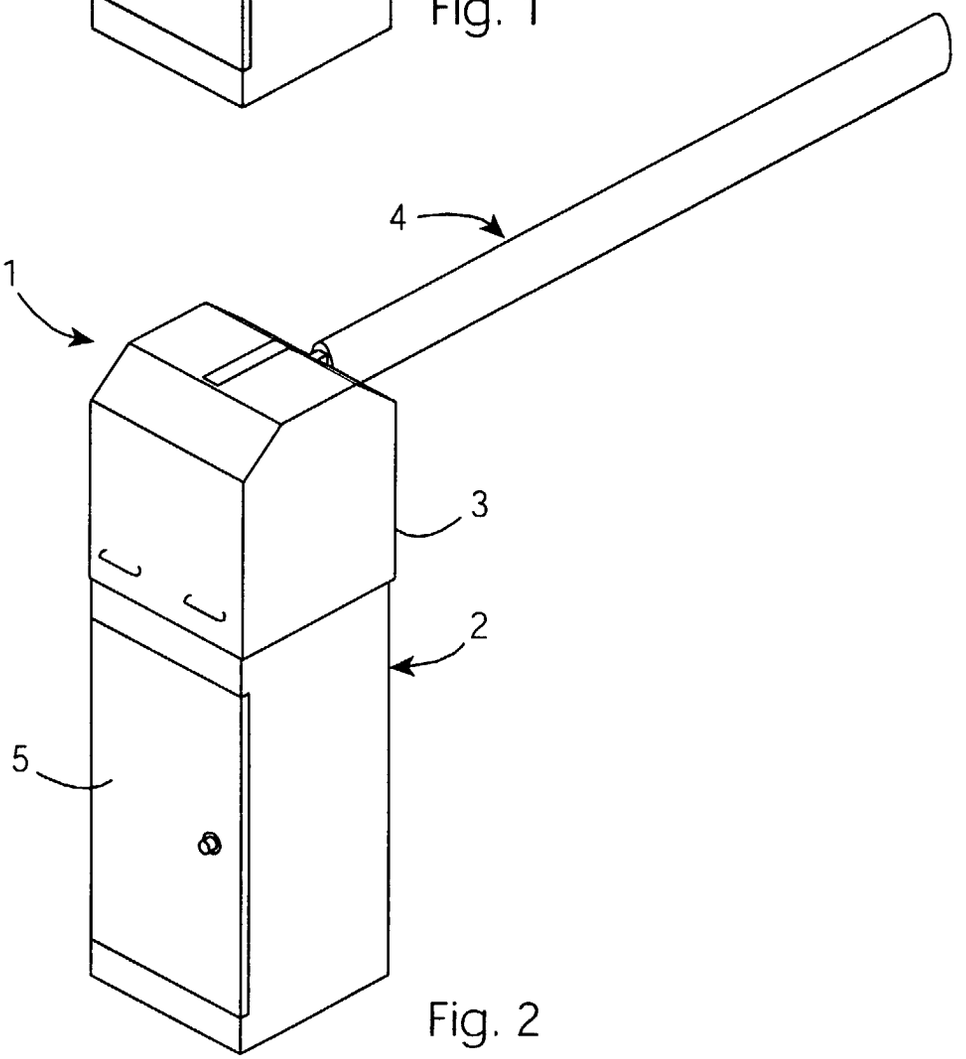

Fig. 2

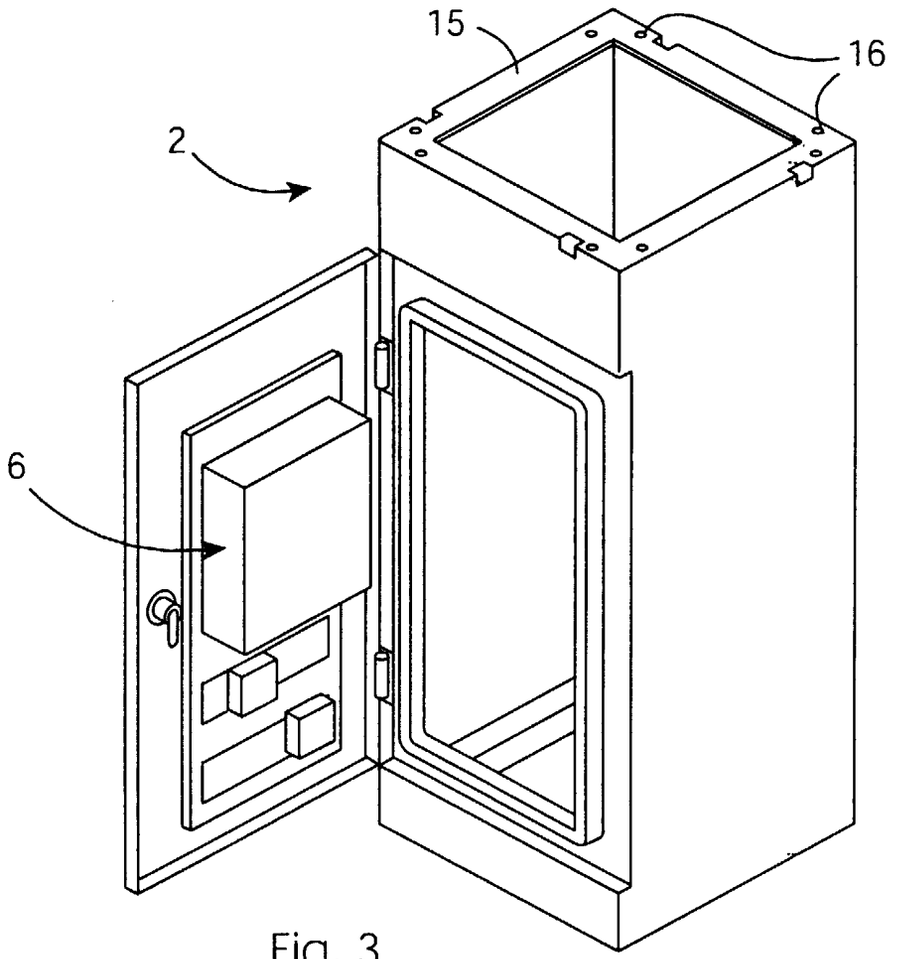

Fig. 3

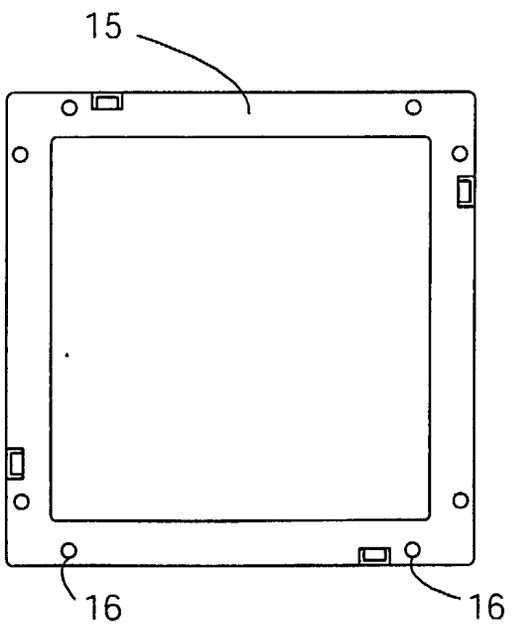

Fig. 4(a)

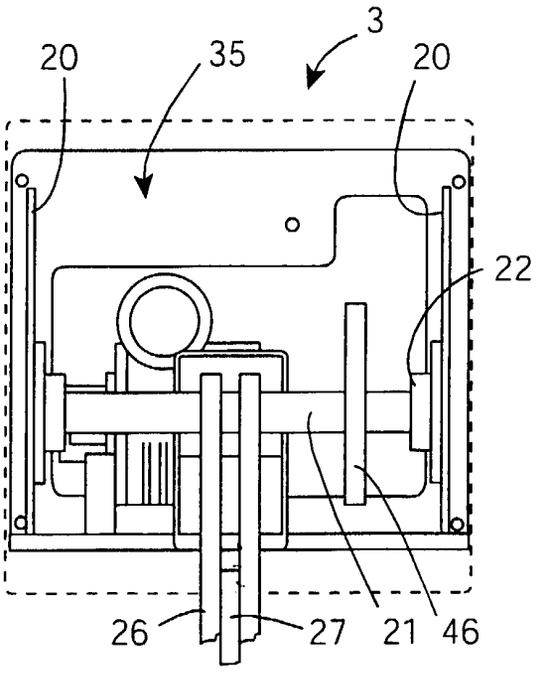

Fig. 4(b)

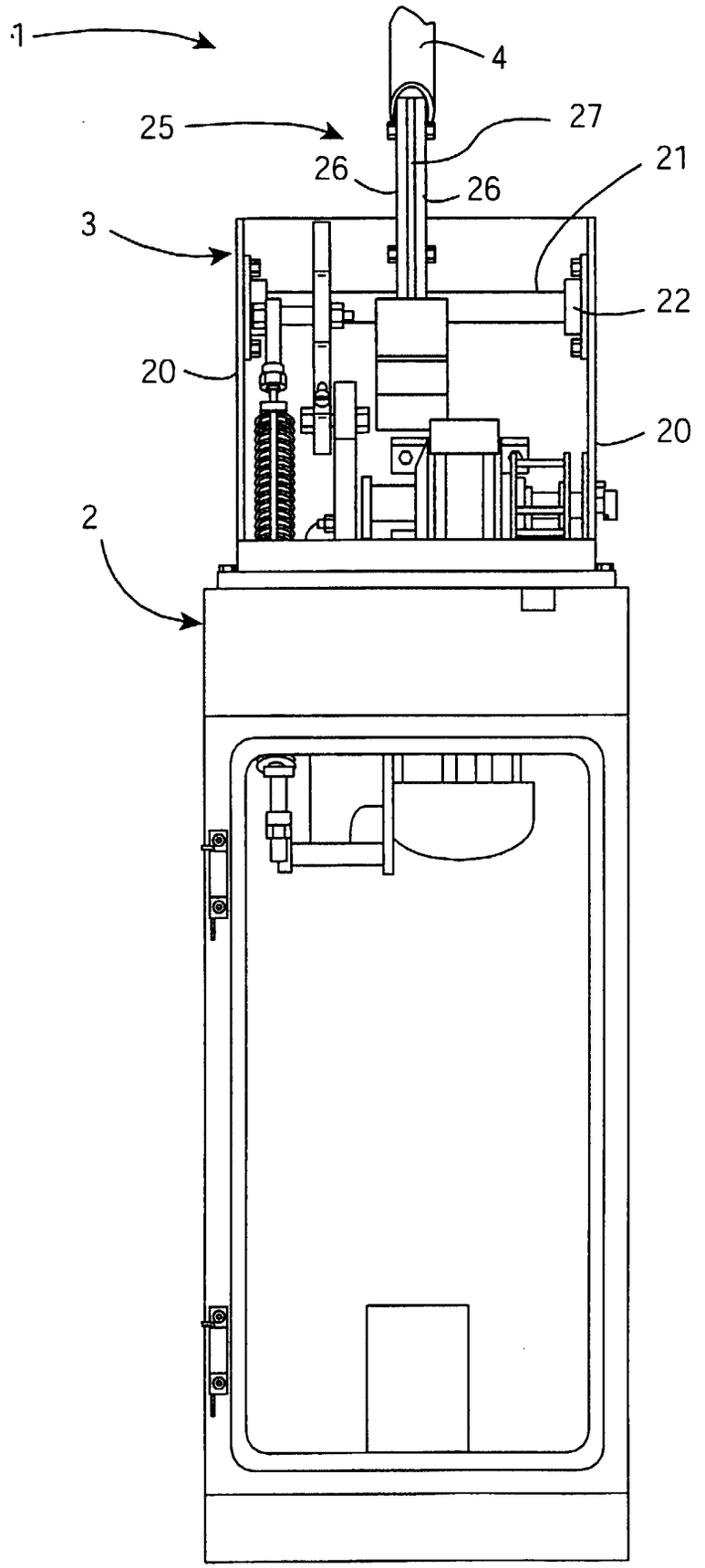

Fig. 5

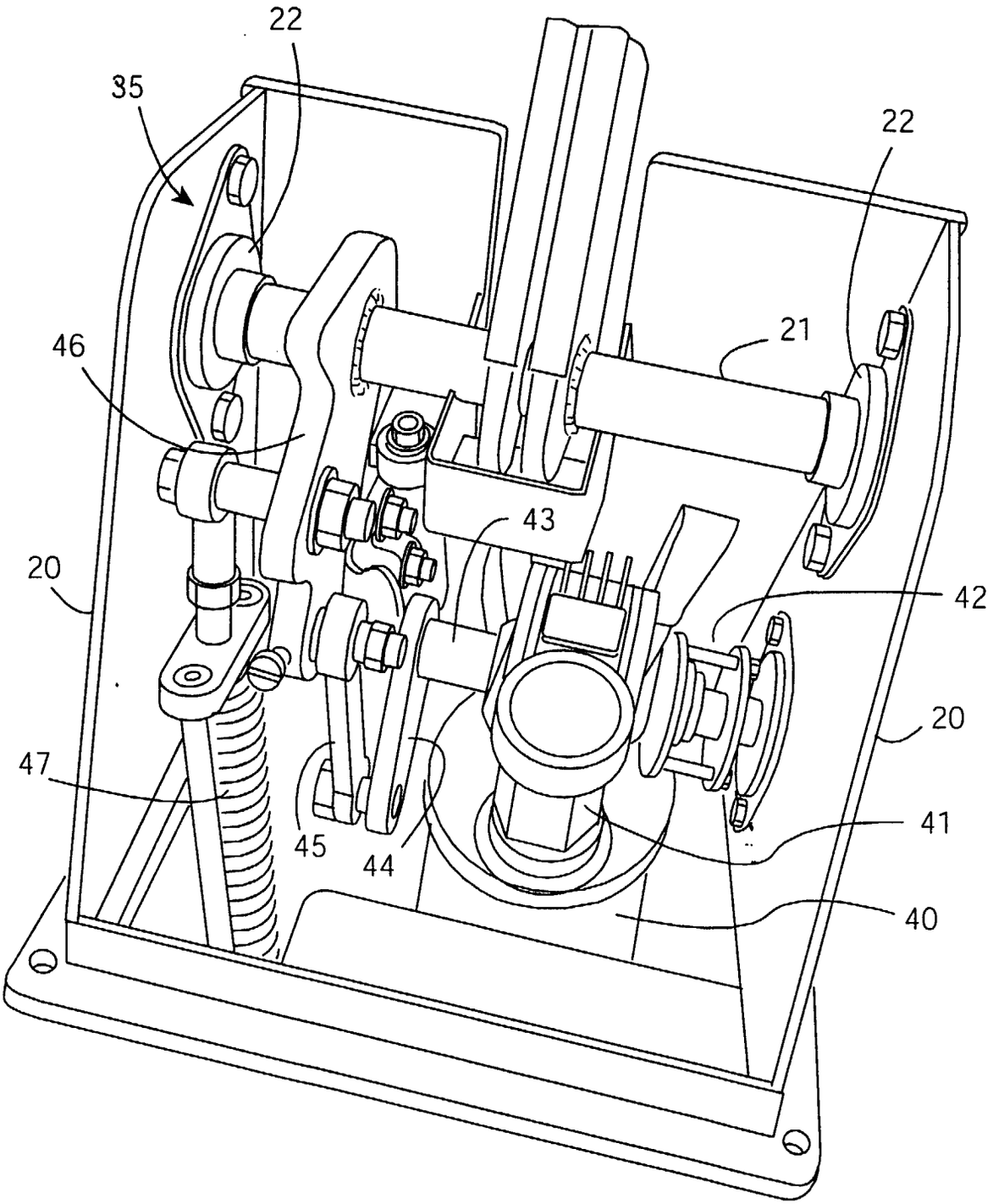

Fig. 6

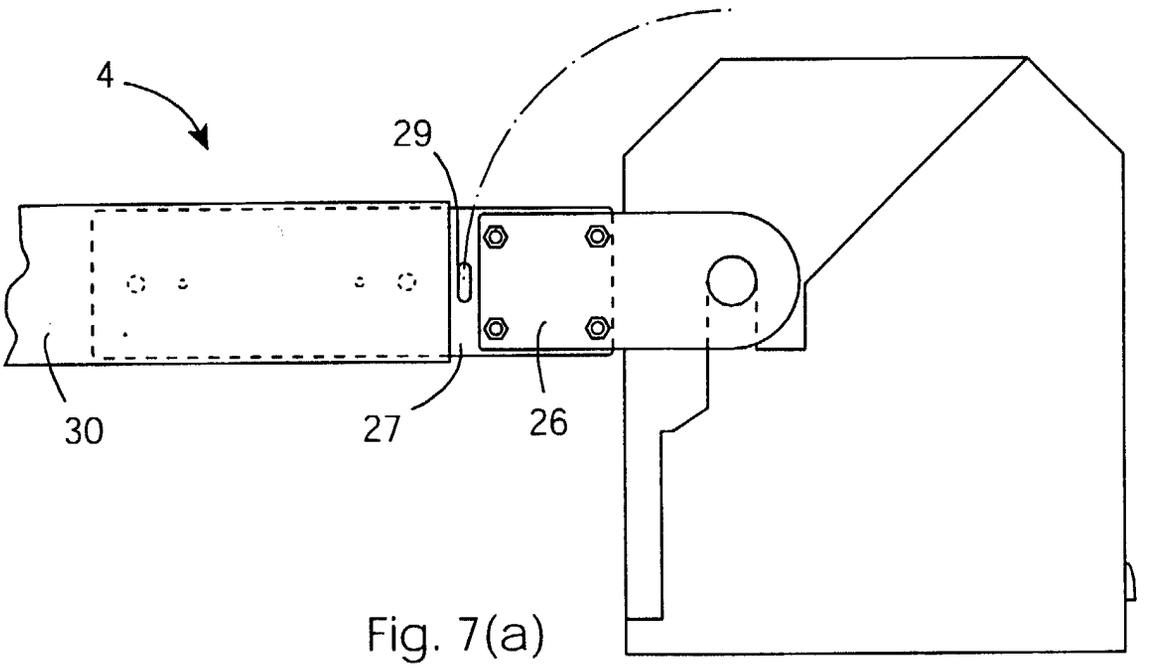

Fig. 7(a)

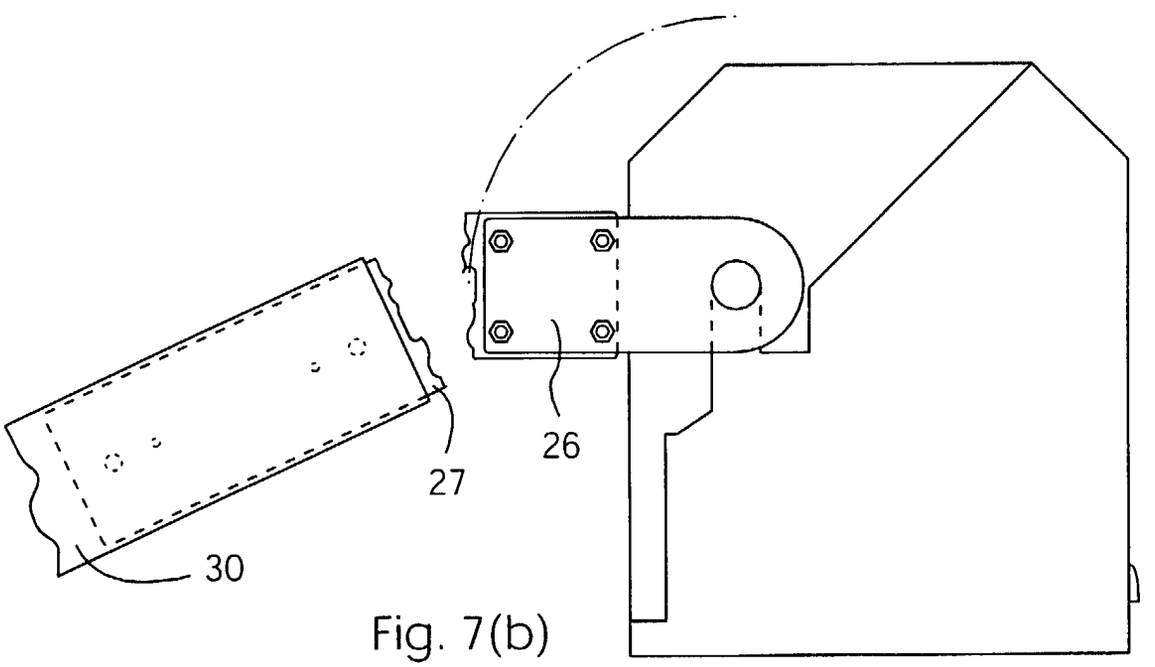

Fig. 7(b)

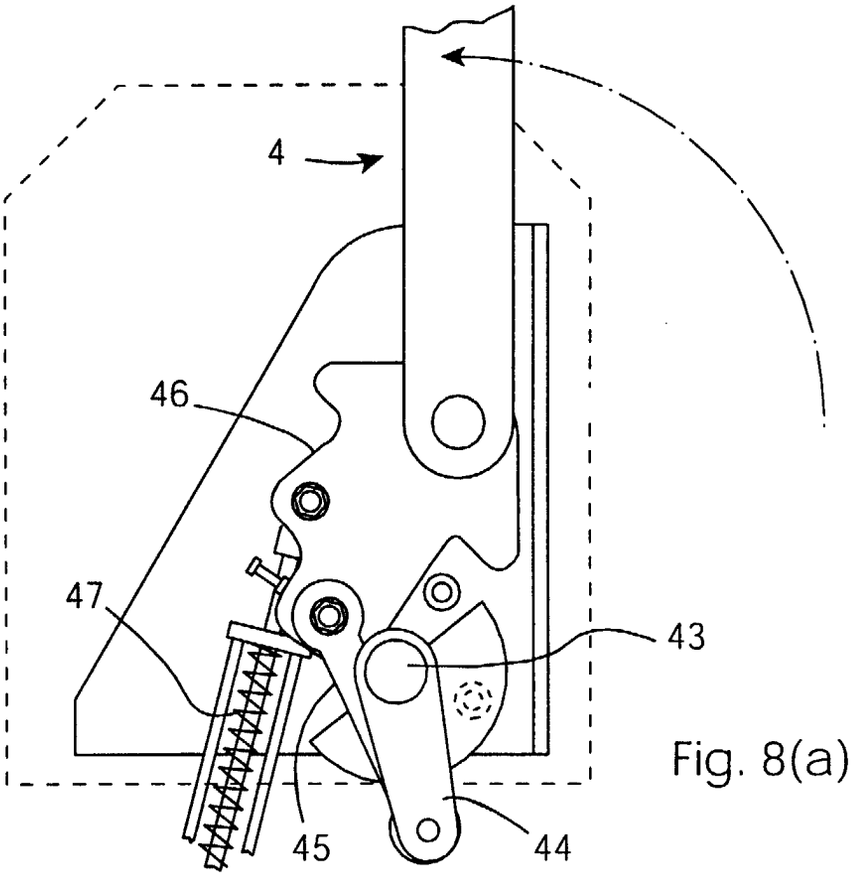

Fig. 8(a)

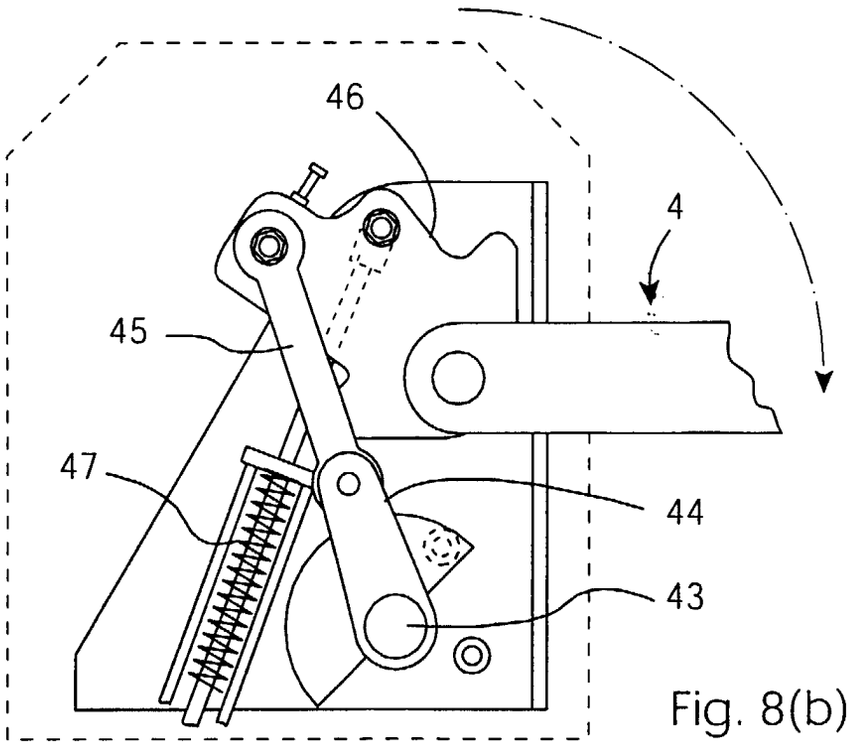

Fig. 8(b)

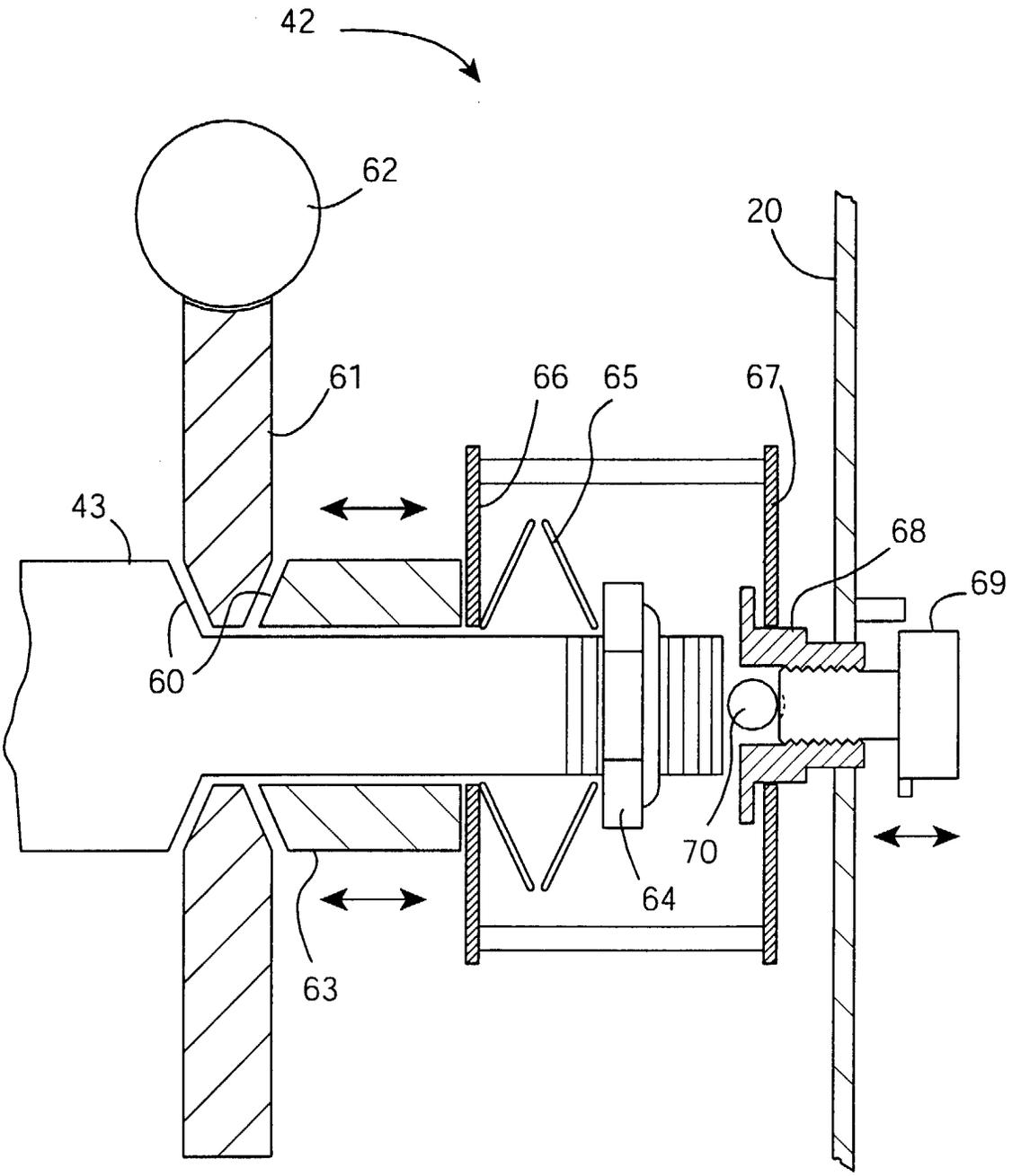

Fig. 9