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

(11) Publication number: **0 199 544**
**A2**

# (12) EUROPEAN PATENT APPLICATION

(21) Application number: **86302866.8**

(22) Date of filing: **17.04.86**

(51) Int. Cl.⁴: **B 66 F 9/14**

(30) Priority: **19.04.85 GB 8510228**

(43) Date of publication of application:
**29.10.86 Bulletin 86/44**

(84) Designated Contracting States:
**AT BE CH DE FR GB IT LI NL**

(71) Applicant: **Coventry Climax Limited**
**Sandy Lane**
**Coventry CV1 4DX(GB)**

(72) Inventor: **Wakefield, Brian**
**Coventry Climax Limited Sandy Lane**
**Coventry CV1 4DX(GB)**

(74) Representative: **Cowan, David Robert et al,**
**WALFORD AND HARDMAN BROWN Trinity House Hales Street**
**Coventry CV1 1NP West Midlands(GB)**

## (54) Fork lift truck.

(57) A fork lift truck which has a mast 13 and a sub-frame 22 which moves up and down the mast is provided with a carriage 30 which is mounted for sideways movement relative to the sub-frame.

The sideways movement is achieved by rams 40, 41 connected between the sub-frame 22 and the carriage 30 and located to either side of a central region to provide better visibility.

The fork mounting is an integral unit to reduce the loss of lifting capacity resulting from add-on side shift arrangements.

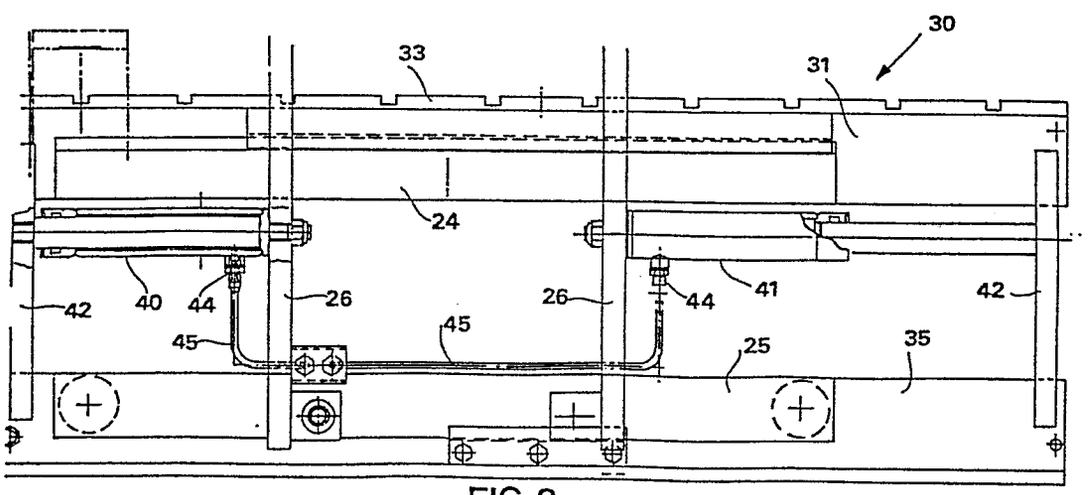


FIG.3

EP 0 199 544 A2

# Fork Lift Truck

This invention relates to fork lift trucks and, in particular, to fork lift trucks in which the fork arrangement is adapted to effect a side to side or side shift movement in addition to an up and down movement.

Conventionally the side shift movement of the fork has been achieved by adding an additional moveable side shift carriage in front of the standard carriage and this can adversely affect the position of the centre of gravity of the truck in the fore and aft direction. Moreover the drive means incorporated into the side shift carriage for effecting the side shift movement has been located in a position which can obstruct the forward visibility of the operator. Such a prior arrangement is disclosed in GB-A-2099787.

An object of the invention is to provide an improved fork lift truck incorporating a side shift facility which obviates disadvantages of existing arrangements.

According to the invention a fork lift truck includes a vehicle body on which is mounted an upright mast, a sub-frame movable up and down the mast, a carriage mounted on the sub-frame for reciprocal movement relative to the sub-frame in a generally horizontal direction, and drive means extending between the sub-frame and the carriage for effecting the reciprocal, side shift movement, wherein the drive means includes rams located to the sides of a central region at the front of the vehicle.

Preferably the rams are each single-acting and hydraulically, electrically or pneumatically operated,

one of the rams being arranged to effect a drive movement of the carriage in one direction and the other of the rams being arranged to effect movement in the opposite direction. Alternatively the rams may be double acting and both rams can work together to reciprocally move the carriage.

The central region is conveniently that region between the two upright members defining the mast.

The sub-frame preferably includes transverse members on which are slidably mounted complementary transverse members of the carriage, the forks being carried on the carriage members.

Further features of the invention appear from the following description of an embodiment of the invention given by way of example only and with reference to the drawings, in which:-

Fig. 1 is a perspective view showing the general arrangement of the front end of a fork lift truck,

Fig. 2 is an end view of the mounting for the forks of the fork lift arrangement,

Fig. 3 is an elevation of the mounting of Fig. 2, and

Fig. 4 is an elevation corresponding to Fig. 3 of an alternative embodiment incorporating means for adjusting the spacing between the forks.

Referring to the drawings and firstly to Fig. 1, a fork lift truck generally comprises a wheeled frame 10 having an operator's position with seat 11 and cab 12. In front of the driver's position at one end of the vehicle is a mast 13 which extends generally upwards and which supports for movement up and down on the mast a movable frame 15 on which is carried a pair of forks 16. The forks 16 are of each L-shape having an upright portion 16A which is releasably located on

the frame 15 and a generally horizontal portion 16B which extends forwardly of the vehicle to engage under a load to be picked up and transported by the vehicle.

The frame 15 is movable up and down the mast 13 by drive means 17 extending from the lower to the upper end of the mast and usually taking the form of a driven chain connected to the frame 15. The frame 15 is guided on the mast by rollers (not shown in Fig. 1).

The fork lift truck of Fig. 1 provides an arrangement in which the frame 15 and, therefore, the forks 16 are able to effect an up and down movement only and the frame 15 includes upper and lower transverse members 18 and 19 interconnected towards their ends by upright members 20 to provide a generally rectangular construction.

Conventionally, if it is required to provide a side shift facility, a supplementary carriage (not shown) is provided. This is mounted slidably in front relative to the transverse members 18 and 19 and is movable longitudinally of the members 18 and 19 by, for example a double-acting ram, mounted between the members 20 and interconnecting the carriage and the frame 15. The forks 16 are mounted on the supplementary carriage so that they may be moved from side to side by operation of the ram to accurately position the forks under the load and to place the load accurately, with minimum manoeuvering of the vehicle.

It will be seen that by adding a carriage in front of

the existing frame 15 the centre of gravity of the vehicle is displaced forwardly, thereby reducing the lifting capacity of the vehicle. Moreover the central location of the drive means for the side shift movement of the carriage restricts the operator's visibility of the forks, especially when the load is in an elevated position.

Referring now to Figs. 2 and 3 a mounting for the forks is shown in which the facility for effecting side shift of the forks is integral with the mounting.

A sub-frame 22 is mounted for movement up and down along the mast 13 (only part of which is shown), the sub-frame 22 being guided for such movement by rollers 23. At the forward side of the sub-frame 22 are located upper and lower transverse members 24 and 25 and the members 24 and 25 are interconnected by a pair of spaced apart upright members 26.

The upper transverse member 24 is formed along its upper edge with a bearing surface having horizontal portions 27 and a forwardly inclined or vertical portion 28.

A carriage 30 is mounted on the sub-frame 22 for movement relative thereto in the direction of the transverse member 24 to produce the side shift motion of the forks.

The carriage 30 has an upper transverse member 31 having a rearwardly directed portion 32 hooked over the member 24 and having surfaces in sliding engagement with the bearing surface portions 27 and 28. The carriage transverse member 31 is also formed along its

upper edge with a profile 33 for receiving the upper ends of conventional L-shaped forks 16 (only part of which is shown in Fig. 2).

The forks 16 are each located towards the lower end of the upright portion in relation to a lower transverse member 35 of the carriage 30 by a hooked-shaped member 36 which engages with a correspondly-sectioned portion of the member 35.

The lower transverse member 35 of the carriage is located relative to the lower transverse member 25 of the sub-frame 22 by removable brackets 38 which engage around the rear side of the lower transverse member 25.

Drive means for moving the carriage 30 relative to the sub-frame 22 includes a pair of single-acting hydraulically-operated rams 40 and 41. Each of the rams 40 and 41 is arranged to the outside of the pair of spaced upright members 26 and interconnects the adjacent members 26 of the sub-frame 22 and an upright member 42 of the carriage 30. The upright members 42 extend between and connect the upper and lower transverse members 31 and 35 of the carriage towards the outer ends of the carriage. Alternatively the carriage may be moved by double acting rams or by electrically or pneumatically operated drive means.

The rams 40 and 41 are each arranged so that the ram cylinder is connected to the associated upright member 26 and the ram piston is connected to the associated carriage member 42. A port 44 for introducing and releasing pressure fluid from the cylinder is provided for each ram and the ports 44

are connected to pipes 45 communicating with a source of fluid on the vehicle.

As seen in Fig. 3 the carriage is in an extreme end position with one of the rams 40 fully retracted and the other of the rams 41 fully extended.

By the provision of the rams 40 and 41 to the sides of the upright members 26 it will be seen that the central area between the members 26, which is the central viewing area for the operator, is unobstructed by the rams. Even to the sides of the central area the rams, being single-acting, are relatively small in dimensions and do not offer much obstruction to the view of the operator to the sides of the central area.

The fork lift arrangement described can be used with or without the side shift facility. If the side shift facility is not required the rams can be simply omitted and the carriage locked to the sub-frame in a central position.

Due to the provision of the carriage integrally with the sub-frame the centre of gravity of the vehicle in the fore and aft direction is not disadvantageously placed compared with prior arrangements in which no side shift facility is provided and is considerably better placed compared with prior arrangements in which the side shift carriage is an added, optional feature. This is due to the mounting for the forks 16 being closely adjacent the vertical plane containing the transverse members 24, 25.

Referring now to Fig. 4 an additional facility enabling the forks 16 to be adjustably spaced relative to one

another is provided. The arrangement is in other respects similar to that of Figs. 2 and 3 with rams 40 and 41 for effecting the sideways movement of the forks 16 to take place simultaneously. Further rams 50 and 51 are provided one ram 50 being connected to one of the forks 16 at one end and the other end of the ram 50 being connected to the member 42. Similarly the other fork 16 is connected to the other member 42 at the other end of the frame and to the other fork 16. Either the ram 50 or 51 is selected for operation so that the associated fork 16 can be moved in relation to the other fork 16, full extension of the associated ram 50 or 51 moving the fork to the chain line position towards the end of the frame. Full extension of both rams 50 and 51 causes the forks 16 to be positioned at their widest chain line positions as shown. Operation of the rams 50 and 51 causes the associated forks 16 to slide along the transverse members 31 and 35 of the carriage.

Claims

1. A fork lift truck which includes a vehicle body 10 on which is mounted an upright mast 13, a sub-frame 22 movable up and down the mast, a carriage 30 mounted on the sub-frame 22 for reciprocal movement relative to the sub-frame in a generally horizontal direction, and drive means 40, 41 extending between the sub-frame 22 and the carriage 30 for effecting the reciprocal or side shift movement, characterised in that the drive means includes rams 40, 41 located to the sides of a central region at the front of the vehicle.

2. A truck according to claim 1 characterised in that the rams 40, 41 are each single acting and hydraulically, electrically or pneumatically operated, one of the rams 40 being arranged to effect a drive movement of the carriage in one direction and the other of the rams 41 being arranged to effect movement in the opposite direction.

3. A truck according to claim 1 or 2 wherein the mast 13 is defined by two upright members 20, characterised in that said central region is located between the two upright members.

4. A truck according to any one of the preceding claims characterised in that the sub-frame includes transverse members 24, 25 on which are slidably mounted complementary transverse members 31, 35 of the carriage, the forks 16 being carried on the carriage members 31, 35.

5. A truck according to claim 4 characterised in that support means 33 for the forks 16 on the transverse members 31 is located closely adjacent the vertical plane containing the transverse members 24, 25 of the sub-frame and the transverse members 24, 25 are mounted directly in front of the mast 22.

6. A truck according to any one of the preceding claims characterised by adjustment means 50, 51 for adjusting the spacing between the forks 16.

0199544

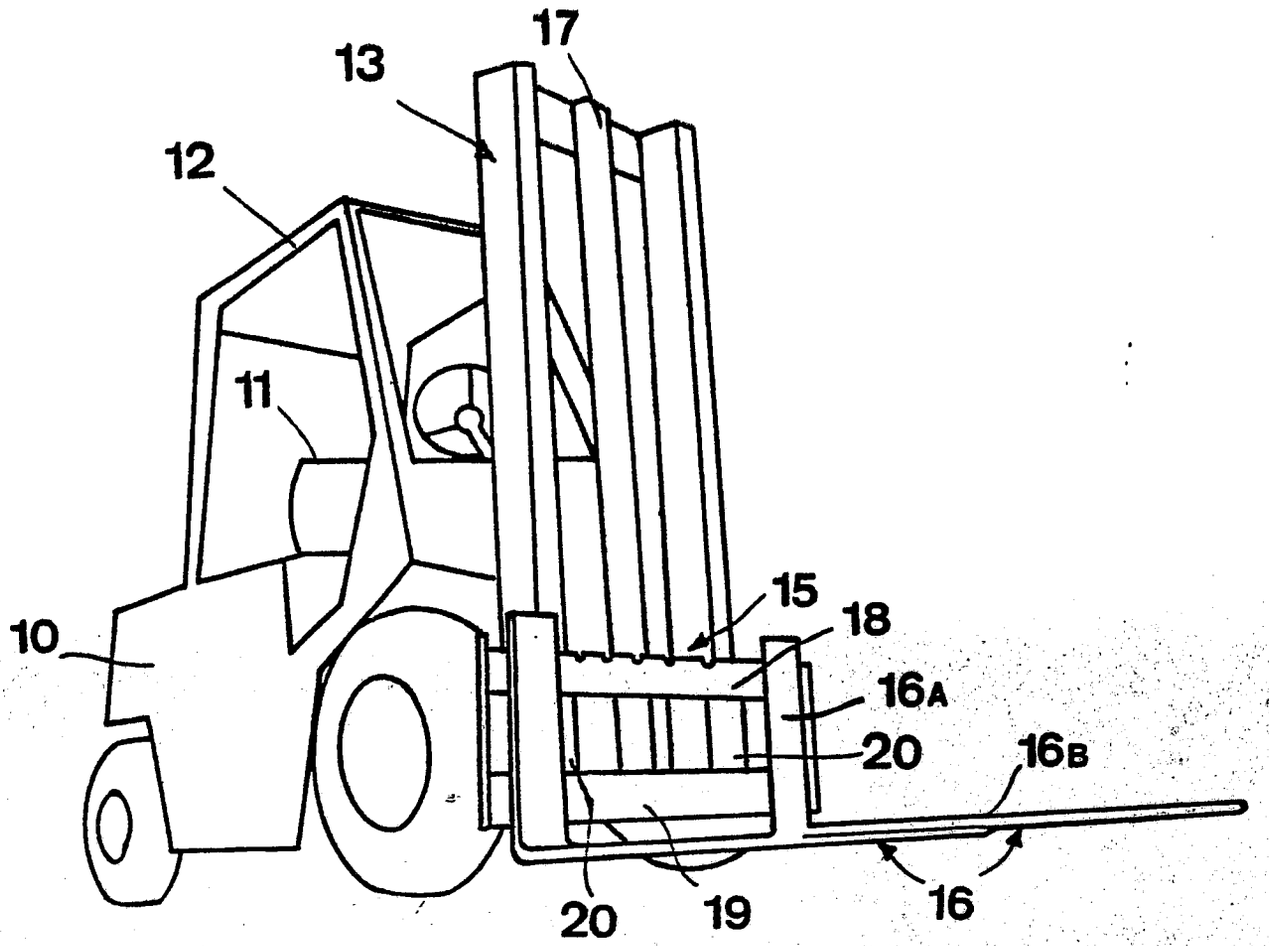


FIG.1

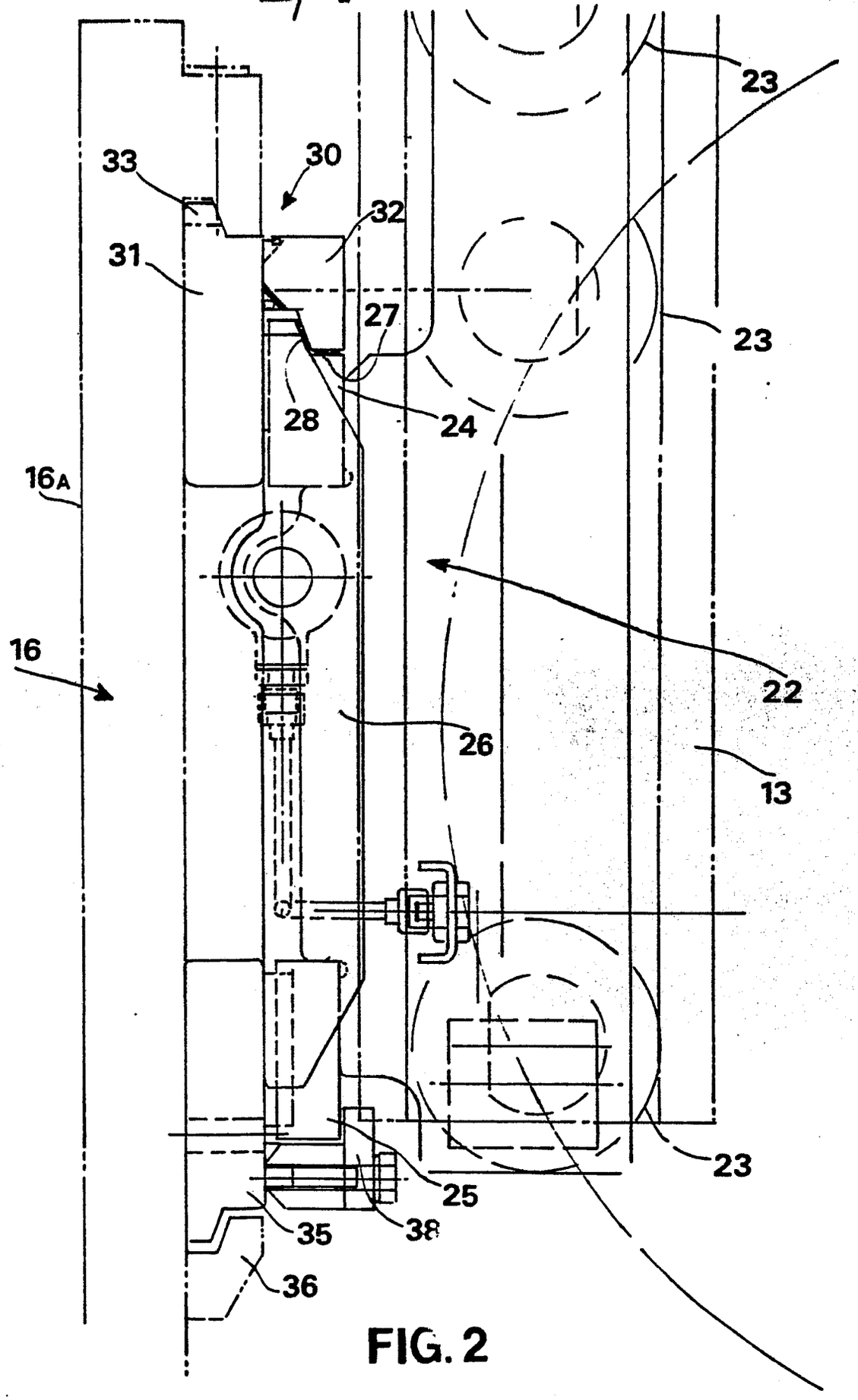


FIG. 2

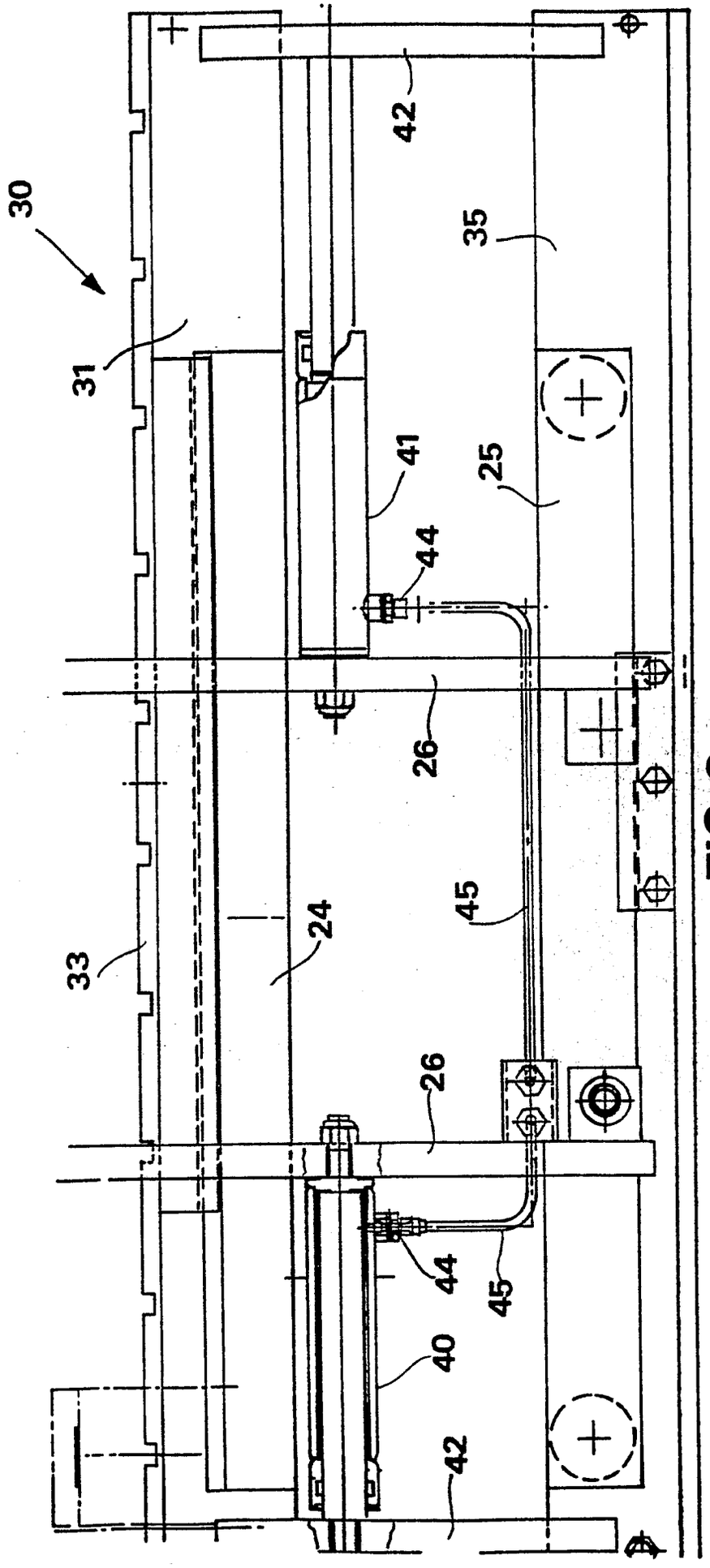


FIG.3

0199544

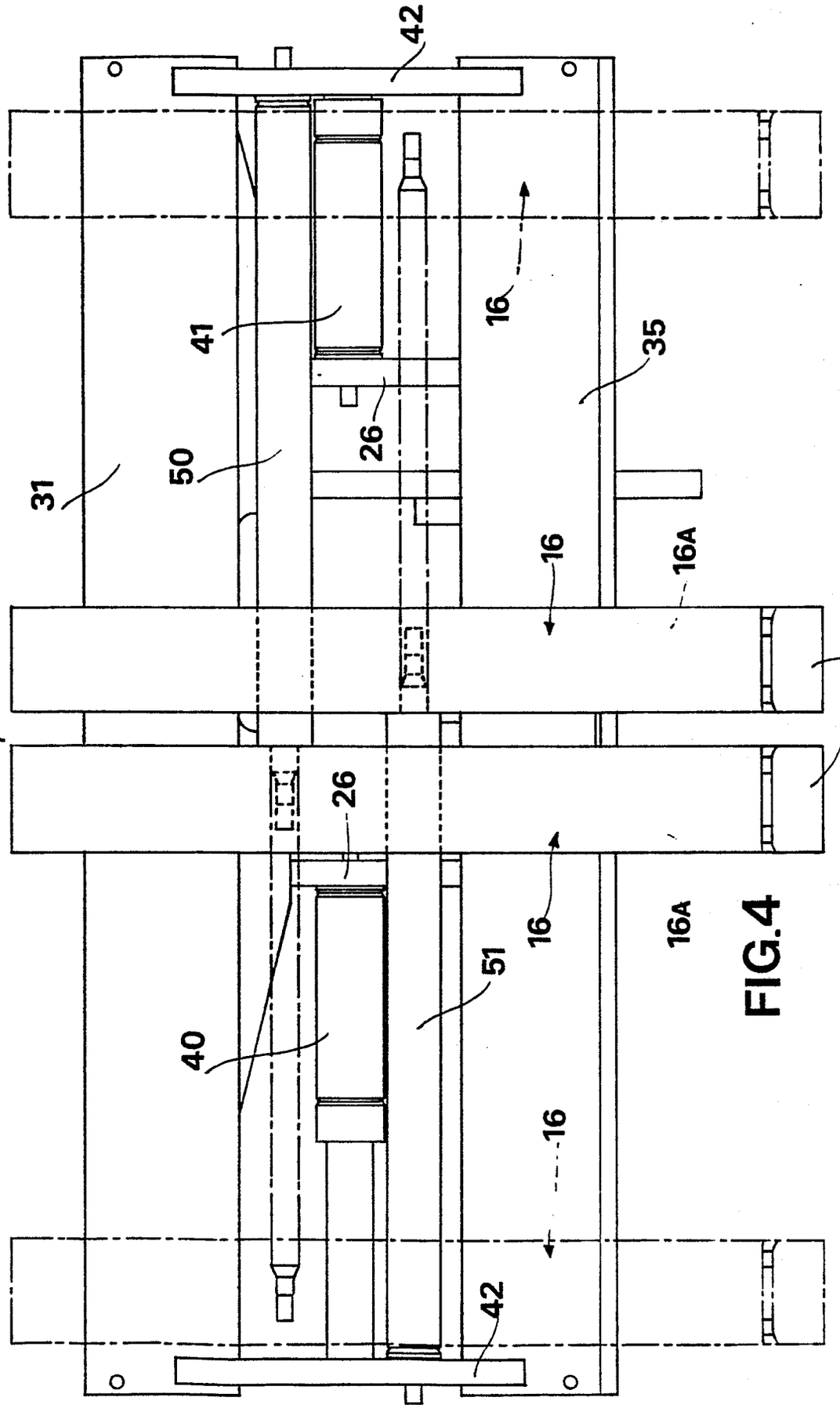


FIG.4

4/4