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(54) **Transfer arrangement**

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**EP 0 803 454 B1**

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## Description

**[0001]** This invention relates to a transfer arrangement and, in particular but not exclusively, to an arrangement for linear transfer of heavy or bulky items.

**[0002]** In many industries bulk materials and other large or heavy items are transferred within factories using bogies which travel along rails or tracks mounted in a channel below floor level. The bogies are typically connected to an endless chain which passes around a sprocket driven by an electric or hydraulic motor. While such transfer systems generally operate satisfactorily, the chains do tend to stretch, requiring adjustment of the system, and such stretching does not tend to occur evenly over the length of the chain such that chains may have to be replaced at relatively frequent intervals. In addition, chains are vulnerable to contamination and may wear rapidly if used in dirty or dusty environments. Further, the requirement to provide an electric or hydraulic motor below floor level complicates the installation and maintenance of such systems.

**[0003]** It is among the objects of aspects of the present invention to provide a transfer arrangement which obviates or mitigates these disadvantages.

**[0004]** US-A-3421718 discloses an aircraft launching system which uses a rodless cylinder which is installed within a floor structure and coupled through a slot in the cylinder and a slot in the floor structure to a wheeled cart which is mounted on a track above the floor level. Mechanical handling apparatus is known from WO-A-88/02347 in which a rodless air cylinder is used to move a pallet carrier, the pallet carrier being mounted to one side of a housing accommodating the rodless cylinder. US-A-3838769 discloses a conveyor for installation in a floor structure, the conveyor including a conveyor beam in the form of a channel member mounted within a channel shaped trough so that the beam spans the width of the open mouth of the trough. A rodless piston and cylinder device is used to effect displacement of the conveyor beam.

**[0005]** According to one aspect of the present invention there is provided a transfer arrangement installed in a floor, comprising:

a support for an item to be transferred;  
 a rodless cylinder including a piston mounted below floor level;  
 the cylinder defining a first slot which is normally closed by a seal, the seal being arranged to permit a member connected with the piston to move along the first slot with the piston;  
 means extending through a second slot in the floor and connecting the support with said member;  
 means for supplying pressurised fluid to the cylinder to move the piston through the cylinder and thus the support along the second slot in the floor, characterised in that:

said means for connecting the support to said member includes a carriage moveable along a track in the form of a pair of rails extending on both sides of the rodless cylinder, the support being located above floor level and the carriage and track being located beneath the floor level.

**[0006]** According to a second aspect of the present invention there is provided a transfer arrangement for installation in a floor, comprising:

a rodless cylinder defining a first slot;  
 a housing for installation in the floor and having a second slot in an upper wall thereof;  
 a support for an item to be transferred, the support being located externally of the housing in superimposed relation above said upper wall of the housing; the rodless cylinder including a piston, the cylinder being located beneath the support and within the housing, the first slot being normally closed by a seal and the seal being arranged to permit a member connected with the piston to move along the first slot with the piston;  
 means extending upwardly through the second slot in the upper wall of the housing and connecting the support with said member; and  
 means for supplying pressurised fluid to the cylinder to move the piston through the cylinder and thus the support along the second slot in the upper wall, characterised in that said means for connecting the support with said member includes a carriage running on a track located within the housing said carriage and said track being disposed beneath the upper wall of the housing and the support.

The rodless cylinder may be a pneumatic air cylinder.

**[0007]** Pressurised fluid may be supplied to both ends of the cylinder, allowing the piston to be moved in both directions under close control. The cylinder may be pressurised on both sides of the piston and movement of the piston may be achieved by controlled exhaustion of fluid from one end of the cylinder. This arrangement has been found to provide for smooth and controlled movement of the piston and carriage.

**[0008]** The track may be in the form of a pair of parallel rails with the cylinder located therebetween.

**[0009]** The carriage may include wheels or rollers for engaging the track. The wheels or rollers may be configured such that the carriage will be moveable even if one wheel or roller should collapse. The carriage may include three pairs of wheels for engaging a pair of rails, and if one wheel collapses the carriage remains supported and moveable on the rails.

**[0010]** Those parts of the arrangement located below floor level may be mounted within a housing embedded in the floor and defining the slot in the floor.

**[0011]** The connection between the support and the piston may permit a degree of vertical movement such

that if, for example, the carriage wheels should collapse the carriage may come to rest on a fixed structural member, such as a housing, without damaging the cylinder.

**[0012]** The connection between the piston and the support may be releasable. Thus, if the arrangement develops a fault such that the piston cannot be moved, the connection may be released to permit the support to be moved independently of the piston. In many applications it will be possible to move the loaded support manually along the track.

**[0013]** This and other aspects of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of a transfer system according to a preferred embodiment of the present invention;

Figure 2 is a plan view of the system of Figure 1;

Figure 3 is a sectional view through line A-A of Figure 2;

Figure 4 is a somewhat enlarged sectional view through line B-B of Figure 1; and

Figure 5 is a schematic representation of the pneumatic controls of the system in Figure 1.

**[0014]** Figures 1 through 4 illustrate a transfer arrangement 10 for paper rolls in accordance with a preferred embodiment of the present invention.

**[0015]** The arrangement 10 is set in a concrete floor substantially flush with the floor level which is indicated by chain dotted line 12 in Figure 4 of the drawings. In this embodiment the arrangement 10 is utilised to transfer large rolls of corrugated paper, typically weighing around two tonnes, from a loading station at one end of the arrangement to a paper handling machine at the other end of the arrangement.

**[0016]** The arrangement 10 comprises a channel or housing 14 formed of a pair of universal columns 16, 17 joined by a plate 18. The housing 14 is thus inexpensive to manufacture and the external configuration of the housing 14 facilitates secure location of the housing 14 within a floor. Internally, the housing 14 defines a cuboid volume 20 which accommodates a track in the form of a pair of rails 22, 23, a carriage in the form of a bogie 24 which runs on the rails 22, 23 and a pneumatic rodless cylinder 26 which extends through the housing 14 between the rails 22, 23.

**[0017]** The cylinder 26 includes a piston and defines a slot which is normally closed by a seal but arranged to permit a member 27 connected with the piston to move along the slot with the piston. In this embodiment, the cylinder 26 is a 40 mm diameter cylinder with a four metre stroke. The upper face of the housing 14 defines a slot 28 through which a member 30 extends to link the

bogie 24 to a support plate 32 on which the paper rolls are positioned.

**[0018]** The rails 22, 23 are screwed and welded to the face of the housing 14, and as may be seen from Figures 1, 2 and 3 the rails 22, 23 extend beyond one end of the housing 14: in this example, the housing 14 is five metres long while the rails 22, 23 are six metres long. This permits the "free" ends of the rails 22, 23 to be connected by an angle member 34 screwed into the upper faces of the rails 22, 23 and also allows the free ends of the rails to be set in concrete when the track 10 is installed such that the rails 22, 23 do not rely solely upon the housing 14 for support and location.

**[0019]** The bogie 24 includes a central inverted U-shaped channel member 36 on which three pairs of wheels 38 are mounted for engaging the rails 22, 23. The wheels 38 may be mounted to the channel member 36 using stub axles 40 as illustrated, though in other embodiments the end pairs of wheels may be mounted on single axles.

**[0020]** Centrally located within the channel member 36 is a box section 42 which is retained relative to the remainder of the bogie 24 by a pair of cap screws 44 which pass through the support plate 32 and member 30. Mounted to the underside of the box section 42 is a slotted fork 46 which engages a transverse bar 48 linked to the member 27 and hence the cylinder piston. The slots in the fork 46 provide for a degree of vertical movement between the fork 46 and the bar 48 such that the cylinder 26 does not have to support any vertical load and in the event of, for example, the wheels 38 collapsing the support plate 32 will engage the upper face of the housing 14 before the base of the fork slots engage on the bar 48.

**[0021]** The cylinder 26 is fixed on the plate 18 which joins the bases of the columns 16, 17 with a mid-section support 50 and two end supports 52, 53.

**[0022]** The cylinder 26 is connected to a pressurised air supply 54, as illustrated schematically in Figure 5 of the drawings. Air is separately supplied to each end of the cylinder 26 through appropriate tubes 56 and control valves 58, 59. The ends of the cylinder on both sides of the piston are normally pressurised to 6 bar, such that the piston, and thus the bogie 24, is maintained to the desired position. To move the bogie 24 the operator configures one of the valves 58, 59 to exhaust gas from one end of the cylinder, such that the higher pressure in the other end portion of the cylinder pushes the piston towards the low pressure end. The travel of the bogie 24 is limited by a pair of air springs 60, 61 provided at the ends of the housing 14.

**[0023]** The simplicity of the arrangement 10, and the minimal number of moving parts required, allow the arrangement 10 to be manufactured and installed at a lower cost than comparable endless chain transfer systems. Further, initial testing has shown that the arrangement 10 is reliable in operation and it is anticipated that the track will be usable for an extended period (up to 10

years) without requiring substantial maintenance or repair. Testing has also shown that, if necessary, the bogie 24 may be easily uncoupled from the cylinder 26 by removing the cap screws 44 and the cylinder 26 then removed and replaced within the space of 20 minutes. This compares most favourably with maintenance and repair operations on conventional systems. Further, in the unlikely event of a cylinder failure or, for example, failure of the air supply 54, the bogie 24 may be uncoupled from the cylinder 26 to permit the bogie 24, and any paper rolls supported thereon, to be moved manually until an opportunity arises for repairs to be made.

**[0024]** It will be clear to those of skill in the art that the above-described embodiments are merely exemplary of the present invention, and that various modifications and improvements may be made thereto without departing from the scope of the invention as defined by the appended claims.

**[0025]** In particular it will be evident that the transfer arrangement of the present invention may be used in a wide variety of applications, for example, in aircraft transfer systems on the decks of ships.

## Claims

1. A transfer arrangement installed in a floor, comprising:

a support (32) for an item to be transferred;  
 a rodless cylinder (26) including a piston mounted below floor level (12);  
 the cylinder (26) defining a first slot which is normally closed by a seal, the seal being arranged to permit a member (27) connected with the piston to move along the first slot with the piston;  
 means (30) extending through a second slot (28) in the floor and connecting the support (32) with said member (27);  
 means (54, 58, 59) for supplying pressurised fluid to the cylinder (26) to move the piston through the cylinder and thus the support (32) along the second slot (28) in the floor,

### characterised in that:

said means for connecting the support (32) to said member (27) includes a carriage (24) moveable along a track (22, 23) in the form of a pair of rails extending on both sides of the rodless cylinder (26), the support (32) being located above floor level (12) and the carriage and track being located beneath the floor level.

2. A transfer arrangement for installation in a floor, comprising:

a rodless cylinder (26) defining a first slot;  
 a housing (14) for installation in the floor and having a second slot (28) in an upper wall thereof;

a support (32) for an item to be transferred, the support being located externally of the housing in superimposed relation above said upper wall of the housing;

the rodless cylinder (26) including a piston, the cylinder being located beneath the support and within the housing (14), the first slot being normally closed by a seal and the seal being arranged to permit a member (27) connected with the piston to move along the first slot with the piston;

means (30) extending upwardly through the second slot (28) in the upper wall of the housing and connecting the support (32) with said member (27); and

means (54, 58, 59) for supplying pressurised fluid to the cylinder (26) to move the piston through the cylinder and thus the support (32) along the second slot (28) in the upper wall,

**characterised in that** said means (30) for connecting the support (32) with said member (27) includes a carriage running on a track located within the housing (14), said carriage and said track being disposed beneath the upper wall of the housing (14) and the support (32).

3. A transfer arrangement according to Claim 1 or 2 wherein the rodless cylinder (26) is a pneumatic air cylinder.

4. A transfer arrangement according to any one of the preceding claims wherein pressurised fluid is supplied to both ends of the cylinder, allowing the piston to be moved in both directions under close control, movement of the piston being achieved by controlled exhaustion of fluid from one end of the cylinder.

5. A transfer arrangement according to any one of the preceding claims wherein the track is in the form of a pair of parallel rails (58, 59) with the cylinder (26) located therebetween.

6. A transfer arrangement according to any one of the preceding claims wherein the carriage includes wheels or rollers (38) for engaging the track.

7. A transfer arrangement according to Claim 1 or any one of Claims 3 to 6 when dependent on Claim 1 wherein those parts of the arrangement located below floor level (12) are mounted within a housing (14) embedded in the floor and defining the second slot (28) in the floor.

8. A transfer arrangement according to any one of the preceding claims wherein the connection (46, 48) between the support (32) and the piston permits a degree of lost motion in the vertical direction so that, in use, loads carried by the support are not transmitted in the vertical direction to the piston. 5
9. A transfer arrangement according to any one of the preceding claims wherein the connection (46, 48) between the piston and the support (32) is releasable so that, when the connection is released, the support is movable independently of the piston. 10

### Patentansprüche 15

1. In einem Boden installierte Förderanordnung, welche aufweist:

einen Halter (32) für einen zu fördernden Gegenstand; 20  
einen stablosen Zylinder (26) enthaltend einen Kolben, der unterhalb des Bodenpegels (12) angeordnet ist;

wobei der Zylinder (26) einen ersten Schlitz definiert, der normalerweise durch eine Dichtung geschlossen ist, und die Dichtung so angeordnet ist, dass sie einem mit dem Kolben verbundenen Teil (27) ermöglicht, sich entlang des ersten Schlitzes mit dem Kolben zu bewegen; 30

Mittel (30), die sich durch einen zweiten Schlitz (28) in dem Boden erstrecken und den Halter (32) mit dem Teil (27) verbinden; 35

Mittel (54, 58, 59) zum Zuführen von unter Druck stehendem Fluid zu dem Zylinder (26), um den Kolben durch den Zylinder und somit den Halter (32) entlang des zweiten Schlitzes (28) in dem Boden zu bewegen, 40

**dadurch gekennzeichnet, dass:**

die Mittel zum Verbinden des Halters (32) mit dem Teil (27) enthalten einen Schlitten (24), der entlang einer Spur (22, 23) in der Form eines Paares von Schienen, die sich auf beiden Seiten des stablosen Zylinders (26) erstrecken, bewegbar ist, wobei sich der Halter (32) oberhalb des Bodenpegels (12) und der Schlitten und die Spur unterhalb des Bodenpegels befinden. 50

2. Förderanordnung für die Installierung in einem Boden, welche aufweist:

einen stablosen Zylinder (26) der einen ersten Schlitz definiert; 55  
ein Gehäuse (14) für die Installierung in dem Boden, das einen zweiten Schlitz (28) in seiner

oberen Wand aufweist;  
einen Halter (32) für einen zu fördernden Gegenstand, der sich außerhalb des Gehäuses in übereinander liegender Beziehung über der oberen Wand des Gehäuses befindet;  
den stablosen Zylinder (26) enthaltend einen Kolben, wobei der Zylinder sich unterhalb des Halters und innerhalb des Gehäuses (14) befindet, der erste Schlitz normalerweise durch eine Dichtung geschlossen ist und die Dichtung so angeordnet ist, dass eine mit dem Kolben verbundenen Teil (27) ermöglicht wird, sich entlang des ersten Schlitzes mit dem Kolben zu bewegen;  
Mittel (30), die sich aufwärts durch den zweiten Schlitz (28) in der oberen Wand des Gehäuses erstrecken und den Halter (32) mit dem Teil (27) verbinden; und  
Mittel (54, 58, 59) zum Zuführen von unter Druck stehendem Fluid zu dem Zylinder (26), um den Kolben durch den Zylinder und somit den Halter (32) entlang des zweiten Schlitzes (28) in der oberen Wand zu bewegen,

**dadurch gekennzeichnet, dass** die Mittel (30) zum Verbinden des Halters (32) mit dem Teil (27) einen Schlitten enthalten, der auf einer sich innerhalb des Gehäuses (14) befindenden Spur läuft, wobei der Schlitten und die Spur unterhalb der oberen Wand des Gehäuses (14) und des Halters (32) angeordnet sind.

3. Förderanordnung nach Anspruch 1 oder 2, bei der der stablose Zylinder (26) ein pneumatischer Luftzylinder ist.
4. Förderanordnung nach einem der vorhergehenden Ansprüche, bei der unter Druck stehendes Fluid zu beiden Enden des Zylinders geliefert wird, wodurch dem Kolben ermöglicht wird, unter geschlossener Steuerung in beiden Richtungen bewegt zu werden, und die Bewegung des Kolbens erzielt wird durch gesteuerte Ausgabe von Fluid an einem Ende des Zylinders.
5. Förderanordnung nach einem der vorhergehenden Ansprüche, bei der die Spur in der Form eines Paares von parallelen Schienen (58, 59) ist, zwischen denen sich der Zylinder (26) befindet.
6. Förderanordnung nach einem der vorhergehenden Ansprüche, bei der der Schlitten Räder oder Rollen (38) aufweist für den Eingriff mit der Spur.
7. Förderanordnung nach Anspruch 1 oder einem der Ansprüche 3 bis 6, wenn sie von Anspruch 1 abhängig sind, bei der solche Teile der Anordnung, die sich unter der Bodenebene (12) befinden; in einem

Gehäuse (14) befestigt sind, das in dem Boden eingebettet ist und den zweiten Schlitz (28) in dem Boden definiert.

8. Förderanordnung nach einem der vorhergehenden Ansprüche, bei der die Verbindung (46, 48) zwischen dem Halter (32) und dem Kolben einen Grad von verllorener Bewegung in der vertikalen Richtung so ermöglicht, dass bei Benutzung von dem Halter getragene Lasten nicht in der vertikalen Richtung zu dem Kolben übertragen werden. 5
9. Förderanordnung nach einem der vorhergehenden Ansprüche, bei der die Verbindung (46, 48) zwischen dem Kolben und dem Halter (32) so lösbar ist, dass, wenn die Verbindung gelöst ist, der Halter unabhängig von dem Kolben bewegbar ist. 10

### Revendications 20

1. Dispositif de transfert installé dans un plancher, comprenant :

un support (32) pour un élément à transférer ; 25  
 un cylindre sans tige (26) comprenant un piston monté sous le niveau du plancher (12) ;  
 le cylindre (26) définissant une première fente qui est normalement fermée par un joint, le joint étant disposé pour permettre à un élément (27) 30  
 raccordé avec le piston de se déplacer le long de la première fente avec le piston ;  
 un moyen (30) s'étendant à travers une seconde fente (28) dans le plancher et raccordant le support (32) avec ledit élément (27) ; 35  
 un moyen (54, 58, 59) pour fournir un fluide pressurisé au cylindre (26) pour déplacer le piston à travers le cylindre et donc le support (32) le long de la seconde fente (28) dans le plancher, 40

#### caractérisé en ce que :

ledit moyen pour raccorder le support (32) audit élément (27) comprend un chariot (24) mobile 45  
 le long d'une piste (22, 23) sous la forme d'une paire de rails s'étendant des deux cotés du cylindre sans tige (26), le support (32) étant situé au-dessus du niveau de plancher (12) et le chariot et la piste se trouvant sous le niveau du plancher. 50

2. Dispositif de transfert pour l'installation dans un plancher, comprenant :

un cylindre sans tige (26) définissant une première fente ;  
 un boîtier (14) pour l'installation dans le plan-

cher et ayant la seconde fente (28) dans une paroi supérieure de celui-ci ;

un support (32) pour un élément à transférer, le support étant situé à l'extérieur du boîtier dans une relation superposée au-dessus de ladite paroi supérieure du boîtier ;

le cylindre sans tige (26) comprenant un piston, le cylindre étant situé sous le support et dans le boîtier (14), la première tige étant normalement fermée par un joint et la tige étant disposée pour permettre à l'élément (27) raccordé au piston de se déplacer le long de la première fente avec le piston ;

le moyen (30) s'étendant vers le haut à travers la seconde fente (28) dans la paroi supérieure du boîtier et raccordant le support (32) audit élément (27) ; et

le moyen (54, 58, 59) pour fournir un fluide pressurisé au cylindre (26) pour déplacer le piston à travers le cylindre et donc le support (32) le long de la seconde fente (28) dans la paroi supérieure,

**caractérisé en ce que** ledit moyen (30) pour raccorder le support (32) avec ledit élément (27) comprend un chariot se déplaçant sur une piste située dans le boîtier (14) ledit chariot et ladite piste se trouvant sous la paroi supérieure du boîtier (14) et du support (32).

3. Dispositif de transfert selon la revendication 1 ou 2 dans lequel le cylindre sans tige (26) est un cylindre d'air pneumatique.
4. Dispositif de transfert selon l'une quelconque des revendications précédentes dans lequel le fluide pressurisé est fourni aux deux extrémités du cylindre, permettant au piston de se déplacer dans les deux directions sous la commande de fermeture, le déplacement du piston étant réalisé par un échappement commandé du fluide à partir d'une extrémité du cylindre.
5. Dispositif de transfert selon l'une quelconque des revendications précédentes dans lequel la piste est sous la forme d'une paire de rails parallèles (58, 59) avec le cylindre (26) situé entre eux.
6. Dispositif de transfert selon l'une quelconque des revendications précédentes dans lequel le chariot comporte des roues ou des rouleaux (38) pour être en prise avec la piste.
7. Dispositif de transfert selon la revendication 1 ou l'une quelconque des revendications 3 à 6 lorsqu'elles dépendent de la revendication 1 dont les parties du dispositif placé sous le niveau de plancher (12) sont montées dans le boîtier (14) incorporé dans le

plancher et définissant la seconde fente (28) dans le plancher.

8. Dispositif de transfert selon l'une quelconque des revendications précédentes dans lequel un raccordement (46, 48) entre le support (32) et le piston permet un degré de déplacement perdu dans la direction verticale, de sorte que, dans l'utilisation, des charges portées par le support ne sont pas transmises dans la direction verticale au piston. 5 10
9. Dispositif de transfert selon l'une quelconque des revendications précédentes dans lequel le raccordement (46, 48) entre le piston et le support (32) est libérable pour que, lorsque le raccordement est libéré, le support soit mobile indépendamment du piston. 15

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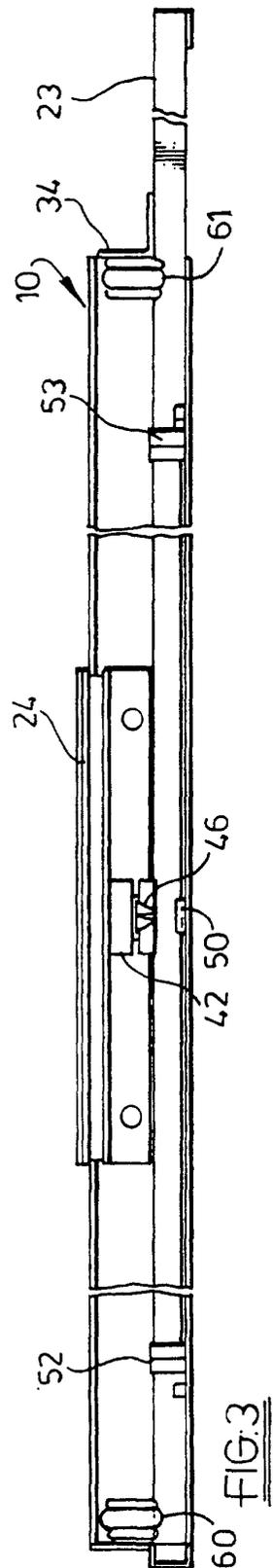
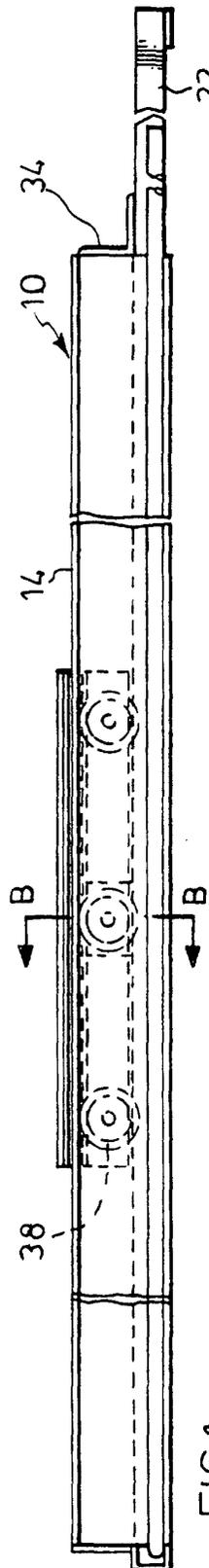
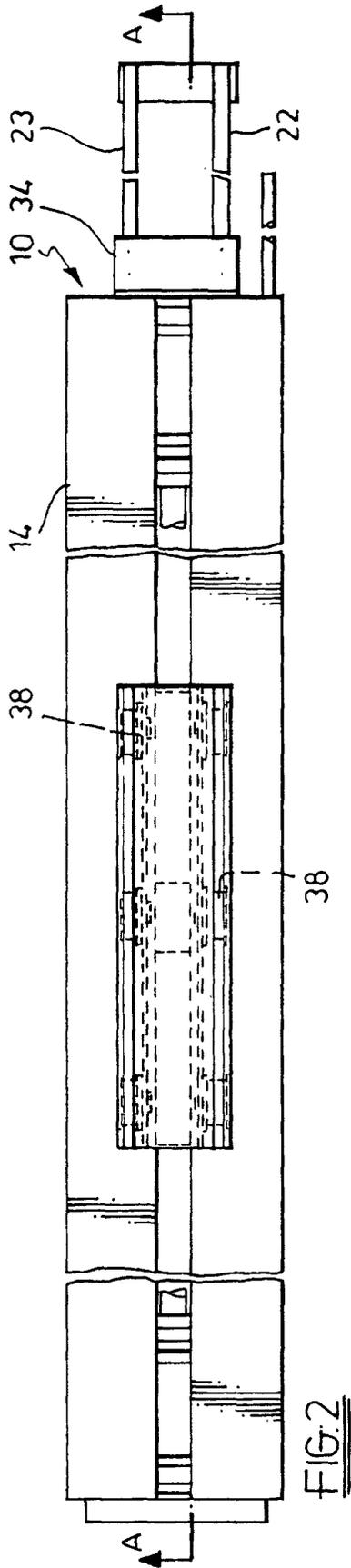
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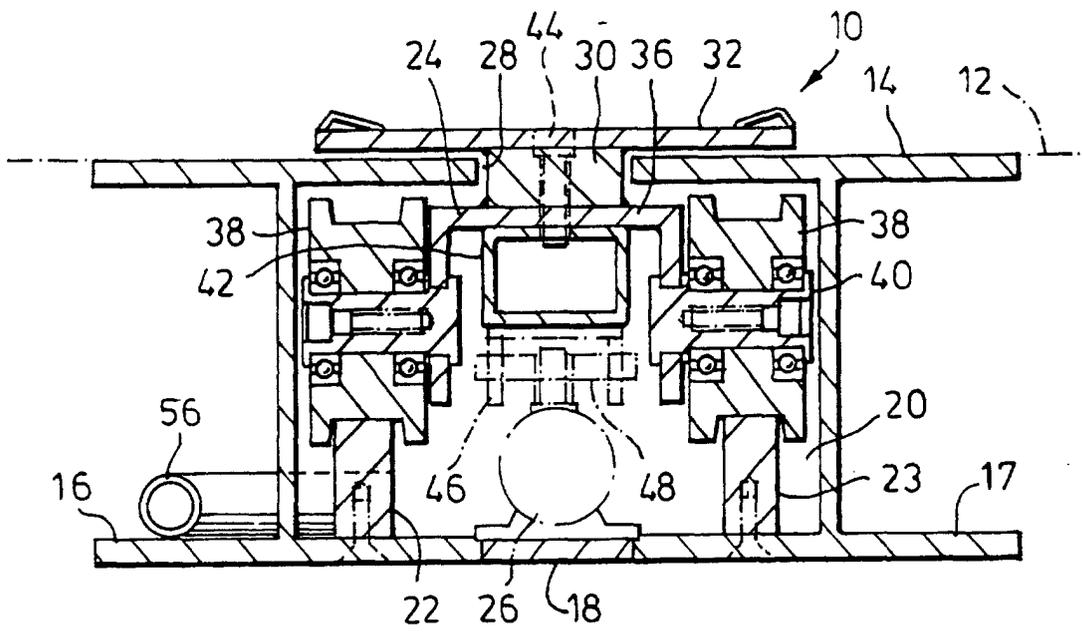


FIG. 4

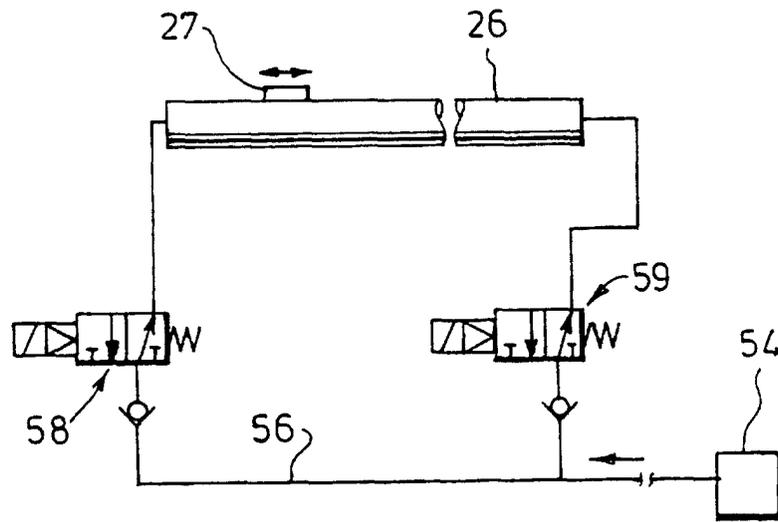


FIG. 5

