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(54) Adjustable carrier rail system.

(57) This invention relates to a levelling system for a rail, and more particularly relates to a system for levelling rails of the type used in mobile shelving systems or other storage systems.

In particular the invention relates to a storage system for fitment to a structure, comprising movable storage units (5) mounted on guide rails (10), wherein the guide rails (10) are attached to the structure by means including a plurality of support units which are independently adjustable to vary the distance between the guide rail (10) and a datum point on the structure.

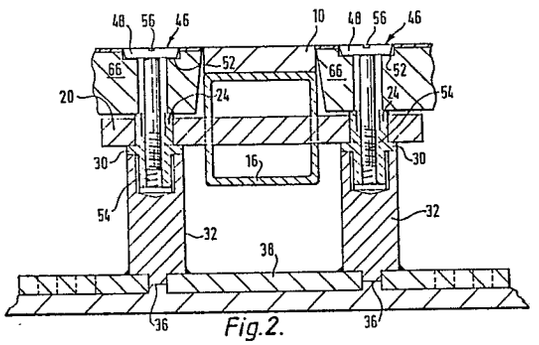


Fig.2.

EP 0 353 019 A1

Description

LEVELLING SYSTEM FOR A RAIL

This invention relates to a levelling system for a rail, and more particularly relates to a system for levelling rails of the type used in mobile shelving sytems or other storage systems.

Shelving systems can carry very high total loads which may be of the order of several hundred tonnes. These loads must be transferred to the structure in which the shelving system is situated, and the structure will deform to some extent in response to the loads.

It is difficult if not impossible to predict the exact response of a structure to an imposed load, particularly if the load is itself unpredictable as may be the case in a shelving system. The implications of this may be serious, particularly where the shelving system is of the mobile type in which shelving units are movably mounted on rails or the like to minimise aisle space requirements. In particular, the floor upon which the rails are mounted (and therefore the rails themselves) may sag or otherwise deform in response to the load exerted by the shelves. This may interfere with the correct operation of the shelving system, causing the mobile shelving units to move towards the lowest point of the rails. This movement may cause injury to an operator, can damage the drive system and is generally inconvenient in use.

It will be clear that the rails of a mobile shelving system must be maintained substantially level. under load if the system is to operate correctly. In existing levelling arrangements, the rails are levelled during installation by means of jacks acting upon the floor to which the rails are attached. These arrangements have several drawbacks. For instance, the jacking force is usually borne by other parts of the structure, generally the floor below the floor being levelled, which causes further unpredictable deformation. More seriously, in existing arrangements it is impossible to make adjustments after installation and therefore there can be no compensation for the deflection which will occur as the shelves are loaded.

An object of this invention is to provide a rail-levelling system which overcomes or mitigates the disadvantages of existing arrangements.

According to one aspect of this invention a storage system for fitment to a structure comprises movable storage units mounted on guide rails, wherein the guide rails are attached to the structure by means including a plurality of support units which are independently adjustable to vary the distance between the guide rail and a datum point on the structure.

According to another aspect of this invention a system for levelling a guide rail includes a plurality of adjustable support units wherein the support units act on a carrier rail which supports and reinforces the guide rail.

This invention also provides a system for levelling a guide rail, the system comprising a plurality of support units for supporting the rail relative to a structure, each support unit including at least two adjustment/support means whereby the height of the guide rail relative to the structure is adjustable and maintained in an adjusted position before and after loading and at least one of the adjustment/support means is located on either side of the guide rail.

According to a further aspect of this invention a tool for simultaneously turning two or more threaded members includes a main pivoting member operable to turn at least one auxiliary pivoting member connected thereto, and has connecting means, associated with the pivoting members, for engagement with the threaded members, wherein two or more connecting means are provided and at least one connecting means is associated with an auxiliary pivoting member.

It is preferred that two auxiliary pivoting members are provided. The pivoting members are suitably gear wheels, and the or each auxiliary gear wheel is suitably meshed with the main gear wheel. The connecting means are preferably hexagonal studs for engagement within hexagonal recesses on the threaded members.

Embodiments and aspects of this invention will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a cross-sectional view of an existing rail arrangement;

Figure 2 is a cross-sectional view of one embodiment of a rail jack/support assembly in accordance with this invention;

Figure 3 is a side view of a carrier rail shown in Figure 2;

Figure 4 is a plan view of a carrier plate shown in Figure 2;

Figure 5 is a cross-sectional view of a jack screw shown in Figure 2;

Figure 6 is a cross-sectional view of a jack barrel shown in Figure 2;

Figure 7 is a plan view of a base plate shown in Figure 2;

Figure 8 is a schematic plan view of an adjustment tool according to this invention, and

Figure 9 illustrates a manually operable mobile storage unit mounted on a system of parallel guide rails.

Figure 1 of the drawings shows a typical existing rail arrangement for a mobile storage system, in which a guide rail 10 is attached to a floor member 12 by means (including) a screw 14 or the like. It will be clear that the floor will deform with the guide rail as the storage system is loaded, and in some structures the floor may deflect by as much as 20mm or more under full load conditions. Correct levelling of the rail depends upon levelling of the floor by means such as the aforementioned jacks.

Referring now to Figure 2 of the drawings, a preferred embodiment of this invention is shown in the form of a guide rail jack support assembly. It is envisaged that a plurality of these assemblies will be used to support and adjust each rail, equally spaced apart with a pitch of about 600mm.

As shown in Figure 2 the guide rail 10 is supported by a square box-section carrier rail 16 which extends along substantially all of the length of guide rail 10. A length of carrier rail 16 is shown in Figure 3 and includes a plurality of equally-spaced rectangular slots 18 which extend through the side walls of the carrier rail 16. The slots 18 of one side wall correspond with the slots 18 of the other side wall to form pairs of oppositely disposed slots.

Each pair of oppositely disposed slots 18 receives a transverse rectangular carrier plate 20 which extends through the carrier rail 16 as shown in Figure 2. The carrier plate 20 is shown in plan view in Figure 4 and includes a pair of circular holes 22 one located towards each end of the plate. The holes 22 each receive a jack screw 24, one of which is shown in detail in Figure 5. The jack screw 24 has a lower portion 26 threaded with a right-hand thread and an upper plain cylindrical portion 28 which is dimensioned for location within a hole 22 of the carrier plate 20. The upper 28 and lower 26 portions are separated by a radially-extending flange 30, which constitutes a bearing surface for the carrier plate 20 as shown in Figure 2.

Each jack screw 24 is supported by a cylindrical jack barrel 32 (shown in detail in Figure 6), the threaded lower portion 26 of the jack screw being threadedly engaged within a correspondingly threaded recess 34 in the top end of the jack barrel. The jack barrel 32 may be of any appropriate length to suit a particular application.

The bottom end of the jack barrel 32 has a spigot 36 for location in a rectangular base plate 38, the base plate being provided with at least one hole 40 (as shown in Figure 7) for receiving the spigot. The base plate 38 is securely attached in a fixed position relative to a datum level of the floor structure, and the jack barrel 32 is welded to the base plate 38 as shown in Figure 2. The base plate 38 is enlarged relative to the carrier plate 20 and the jack barrels 32 to spread the load it bears over a large area of the floor structure.

Referring to Figures 5 and to the jack barrel 32 as shown in Figure 6, each jack screw 24 has a hexagonal recess 42 at its top end for receiving an Allen key or the like. The jack screw 24 may be turned by means of the Allen key, and this causes the jack screw to move along its axis by virtue of the threaded engagement with the jack barrel 32. This movement is reflected by the carrier plate 20 and by the carrier rail 16, and therefore also by the guide rail 10. Accordingly, turning the jack screw 24 effects relative movement between the guide rail 10 and the base plate 38 and this can be used to adjust the height of the guide rail relative to the floor datum level.

Each jack screw 24 is also provided with an axially-extending internal passage 44 which is threaded with a left-hand thread and which extends from the hexagonal recess 42 to the bottom end of the jack screw. The passage 44 is for receiving a capping screw 46 as shown in Figure 2. The capping screw 46 has a flat head portion 48 for flush location within a floor recess 52 and a threaded stem portion 54 for engagement within the passage 44. The head portion 48 may be provided with a recess such as a slot 56 to facilitate turning of the capping screw 46.

The capping screw 46 performs two main functions. Firstly, it prevents dirt from blocking the recess 42, which would otherwise be a problem given the unit's floor location. Secondly, the capping screw acts to lock the jack screw against unwanted rotation by virtue of the conflict between the capping screw's right-hand external thread and left-hand internal thread. As will be clear, the same effect can be obtained if the respective threads are both reversed so long as the threads remain mutually opposed.

It is generally advantageous when adjusting the height of the guide rail 10 to be able to turn both jack screws 24 of a pair by the same amount so as to prevent unwanted twisting about the axis of the carrier rail 20. As shown in Figure 8, this invention provides a tool which allows simultaneous and identical adjustment of jack screws on either side of the carrier rail 20. The tool includes a handle 58 which is operable to turn a central gear wheel 60 about an axial pivot. The central gear wheel 60 meshes with a pair of outer gear wheels 62 whose centres are spaced to correspond to the spacing between two jack screws. The outer gear wheels 62 have associated co-axial hexagonal heads 64 shaped to fit into the recessses 42 in the jack screws, whereby both jack screws may be turned simultaneously by operating the handle 58.

The respective sizes of the central 60 and outer 62 gear wheels may be selected to give a required mechanical advantage so as it make it easier to turn the jack screws. The handle 58 could of course be replaced with a shaft or the like if it was decided to employ a motor to turn the jack screws.

As will be clear to those skilled in the art, this invention provides a means for levelling guide rails which enjoys substantial advantages over known arrangements. For instance, the carrier rail 16 helps to spread the reaction force of the jack/support assemblies so that the guide rail 10 remains substantially flat under load even if the jack/support assemblies are wrongly adjusted in relation to one another. Moreover, the provision of height adjustment means spaced widely apart on either side of the carrier rail 16 helps to prevent twisting of the guide rail 10 and allows for some compensatory adjustment if twisting should occur.

A major advantage of this invention stems from the fact that the height adjustment means are situated between the main floor structure and the carrier rail 16. This means that the main floor structure does not need to be moved to level the carrier rails, which avoids the need for jacking floors. The floor surface panels 66 shown in Figure 2 rest upon the carrier plate 20 and are therefore automatically levelled as the rails are levelled. The adjustment means are readily accessible and easily adjustable, which allows ready levelling of the rails when required. More particularly, this invention makes it feasible to level the guide/carrier rails after the load has been applied for the first time or after there has been any significant variation in the load. Levelling may be performed without removal of floor panels

and with little disruption of the shelving installation or the building in which it is situated.

In general this invention greatly simplifies the levelling process, which minimises the skill requirements, and the cost, of levelling. It is envisaged that this invention will allow the fitment of mobile shelving storage systems to many more buildings than had previously been possible.

Figure 9 illustrates a manually operable mobile storage units S mounted on a system of parallel guide rails. Each storage unit 5 is movable on a plurality of parallel guide rails 10 manually by means of a chain/sprocket drive C which in turn drives a shaft X drivingly connected to wheels W in a manner known per se.

Claims

1. A storage system for fitment to a structure, comprising movable storage units mounted on guide rails, wherein the guide rails are attached to the structure by means including a plurality of support units which are independently adjustable to vary the distance between the guide rail and a datum point on the structure.

2. A system for levelling a guide rail, including a plurality of adjustable support units, wherein the support units act on a carrier rail which supports and reinforces the guide rail.

3. A system for levelling a guide rail, comprising a plurality of support units for supporting the guide rail relative to a structure, each support unit including at least two adjustment/support means whereby the height of the guide rail relative to the structure is adjustable and maintained in an adjusted position before and after loading, and at least one of the adjustment/support means is located on either side of the guide rail.

4. A storage system for fitment to a structure, the system comprising at least one storage unit mounted for movement upon at least two parallel guide rails supported by the structure,
a carrier rail associated with each guide rail and extending longitudinally of the guide rail for supporting the guide rail,
a plurality of support units disposed at different locations longitudinally of each carrier rail, each support unit including at least two adjustable support means with at least one of the said support means located on each side of the carrier rail for varying the distance between the guide rail and a datum on the structure,
a bridging member bridging the adjustable support means located on each side of the carrier rail and cooperating with the carrier rail to change the position of the carrier rail upon adjustment of the adjustable support means.

5. A storage system according to claim 4 wherein the carrier rail is a hollow box section and the bridging members pass through appertures formed on opposite walls of the box section.

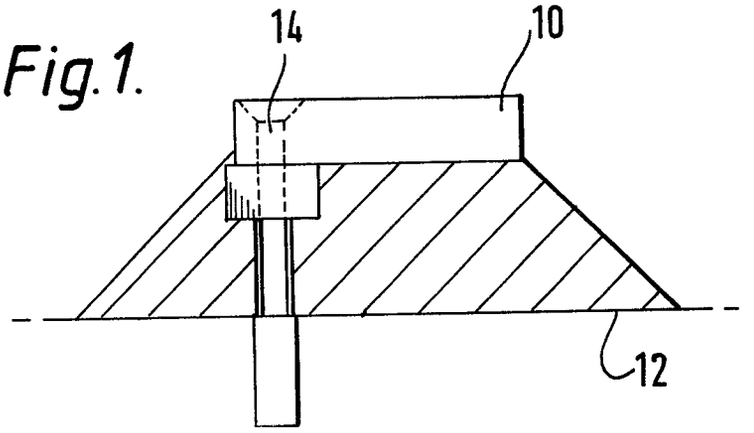
6. A storage system according to claim 4 or claim 5 wherein each guide rail includes at least one laterally extending flange for supporting a floor which is maintained at substantially the same level relative to the guide rail during any adjustment of the guide rail.

7. A storage system according to any preceding claim wherein each adjustable support means is a screw jack accessible for adjustment before and after loading the storage unit.

8. A storage system according to any one of claims 4 to 7 wherein the carrier rail is substantially coextensive with the guide rail to support and reinforce the guide rail along the length and width of the guide rail.

9. A storage system according to claim 4 including means for locking each adjustable support means in any adjusted position.

Fig.1.



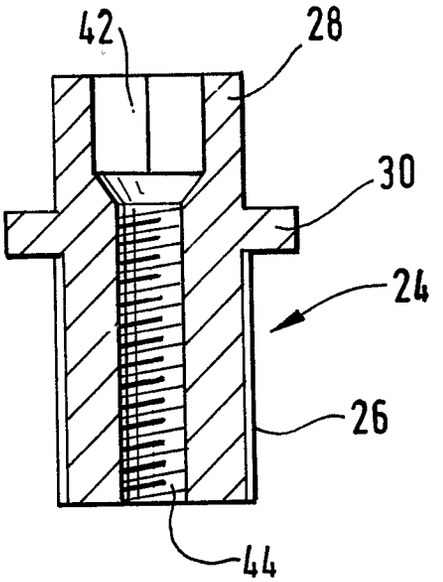


Fig.5.

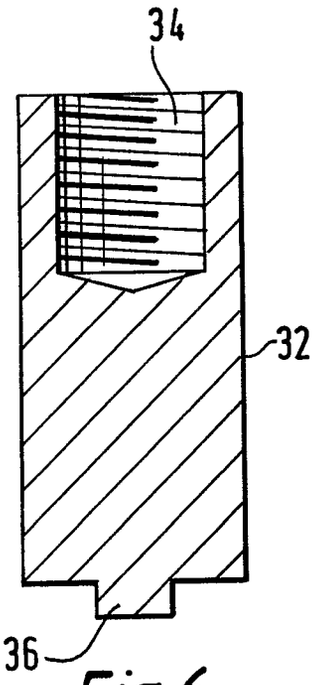


Fig.6.

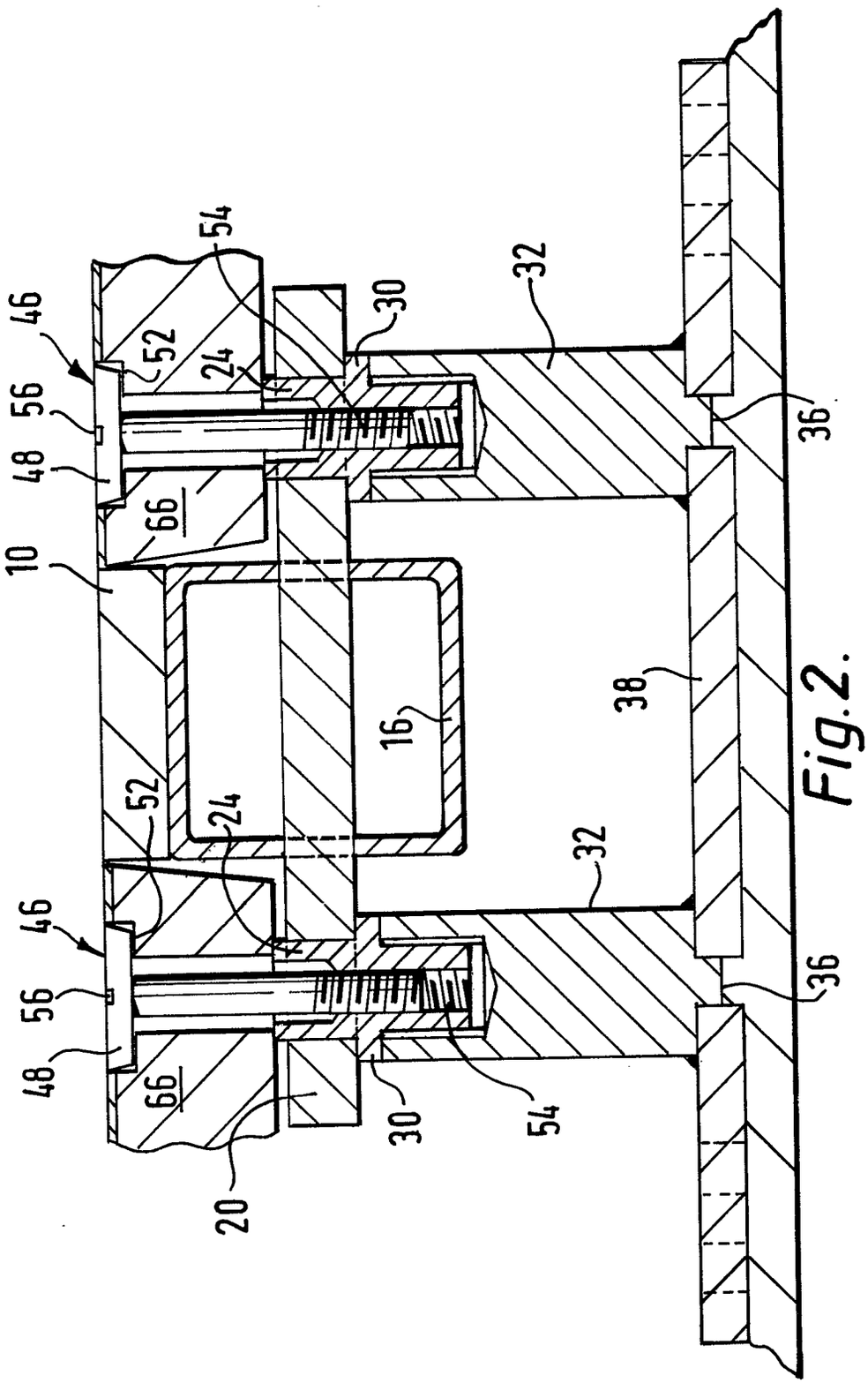


Fig.2.

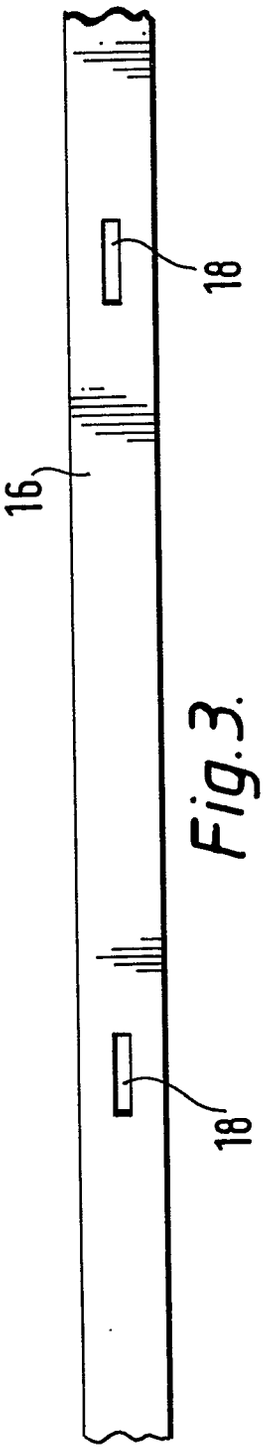


Fig.3.

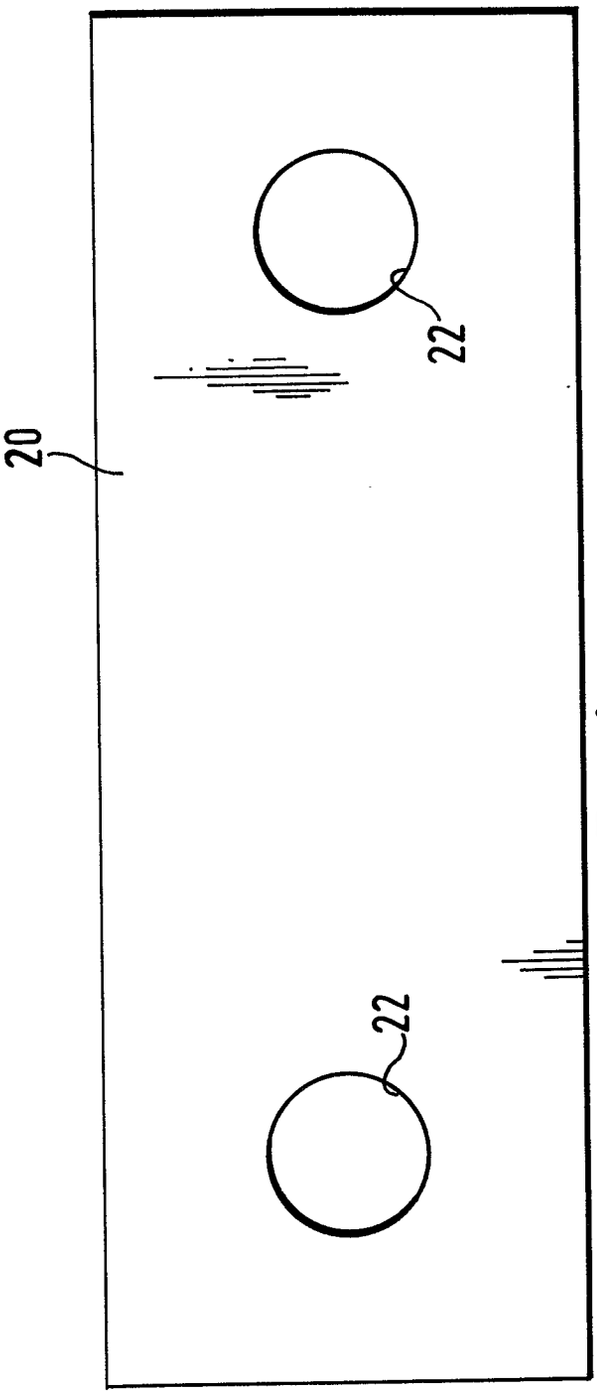


Fig.4.

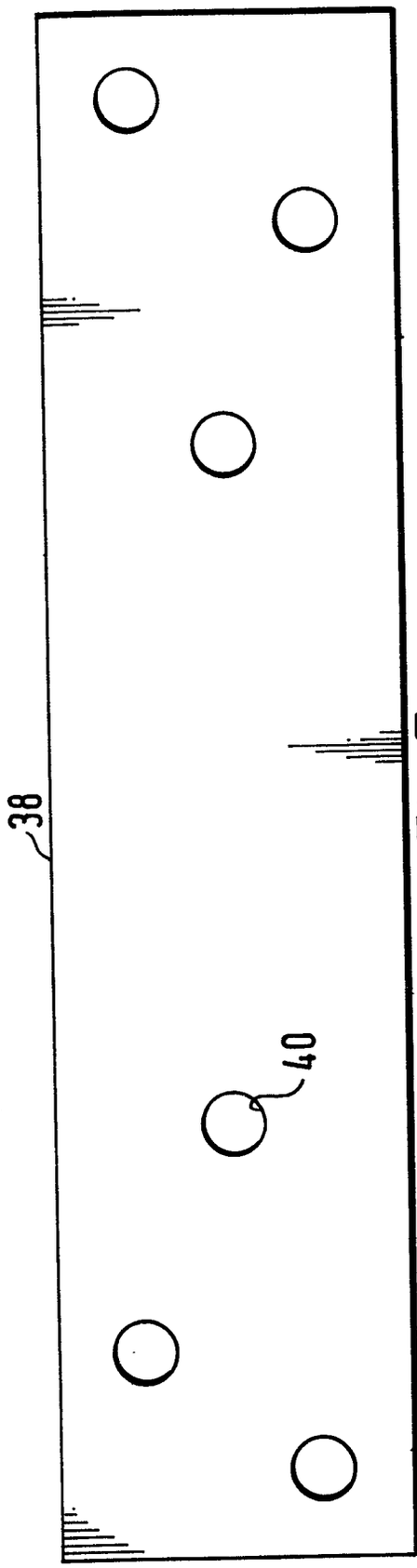


Fig.7.

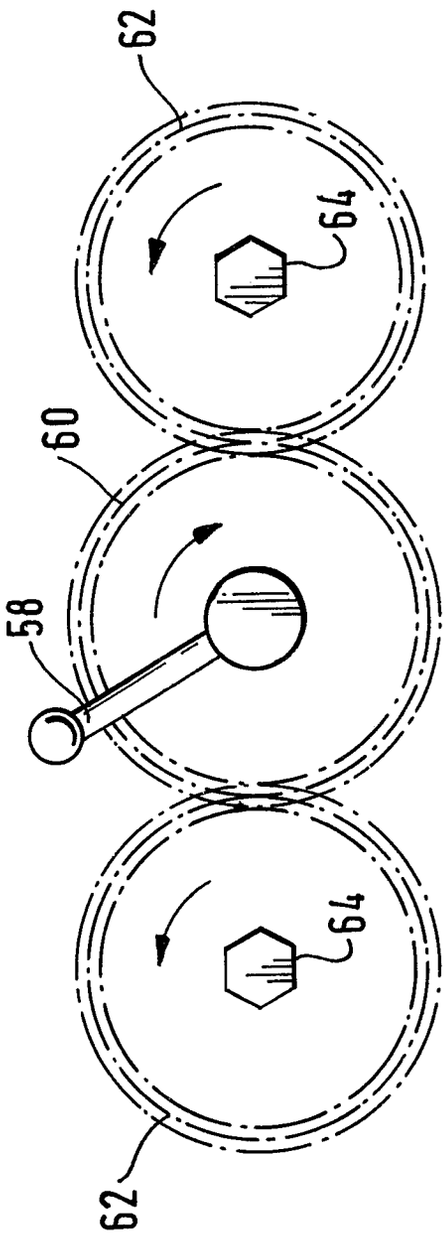


Fig.8.

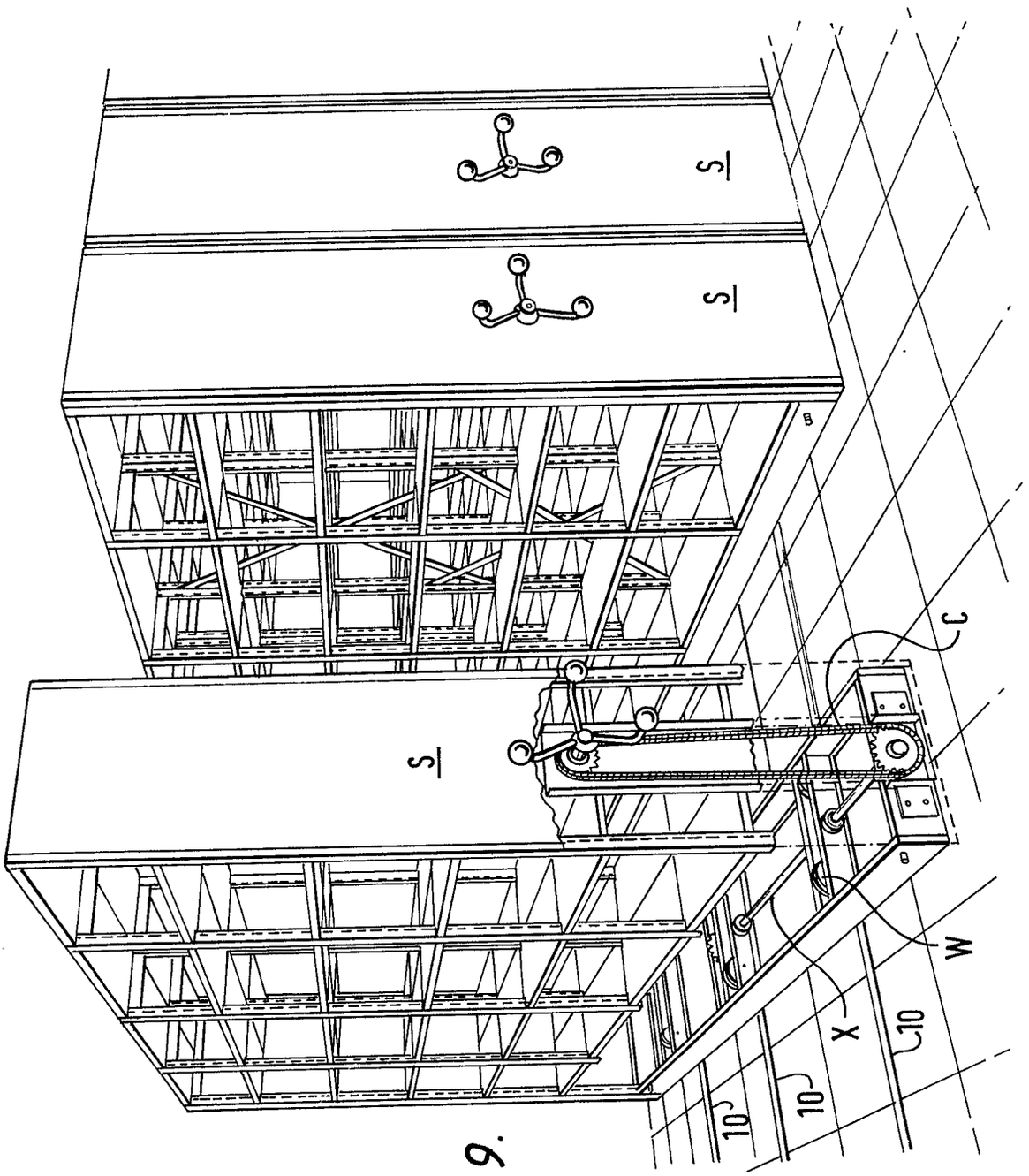


Fig. 9.

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 89307534.1

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.4)
X	DE - A1 - 2 916 936 (SUPREME EQUIPMENT & SYSTEMS CORP.) * Totality *	1,3	B 65 G 1/04 A 47 B 53/02
A	--	2,4	
X	WO - A1 - 88/9 138 (SEGERPALM) * Totality *	1	
A	----	4	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

A 47 B
B 65 G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	18-10-1989	PISSENBERGER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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