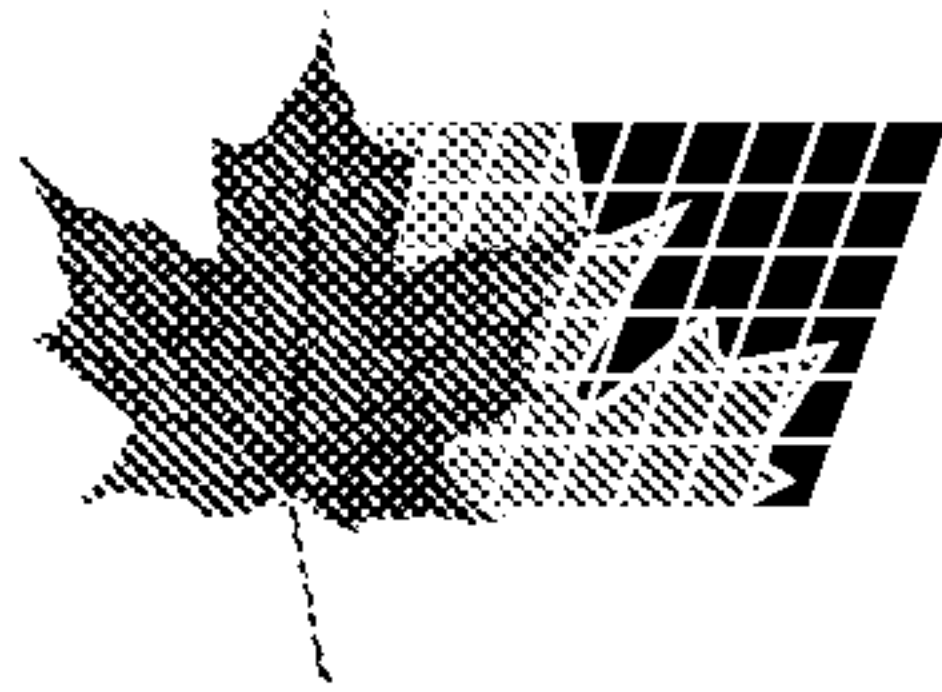




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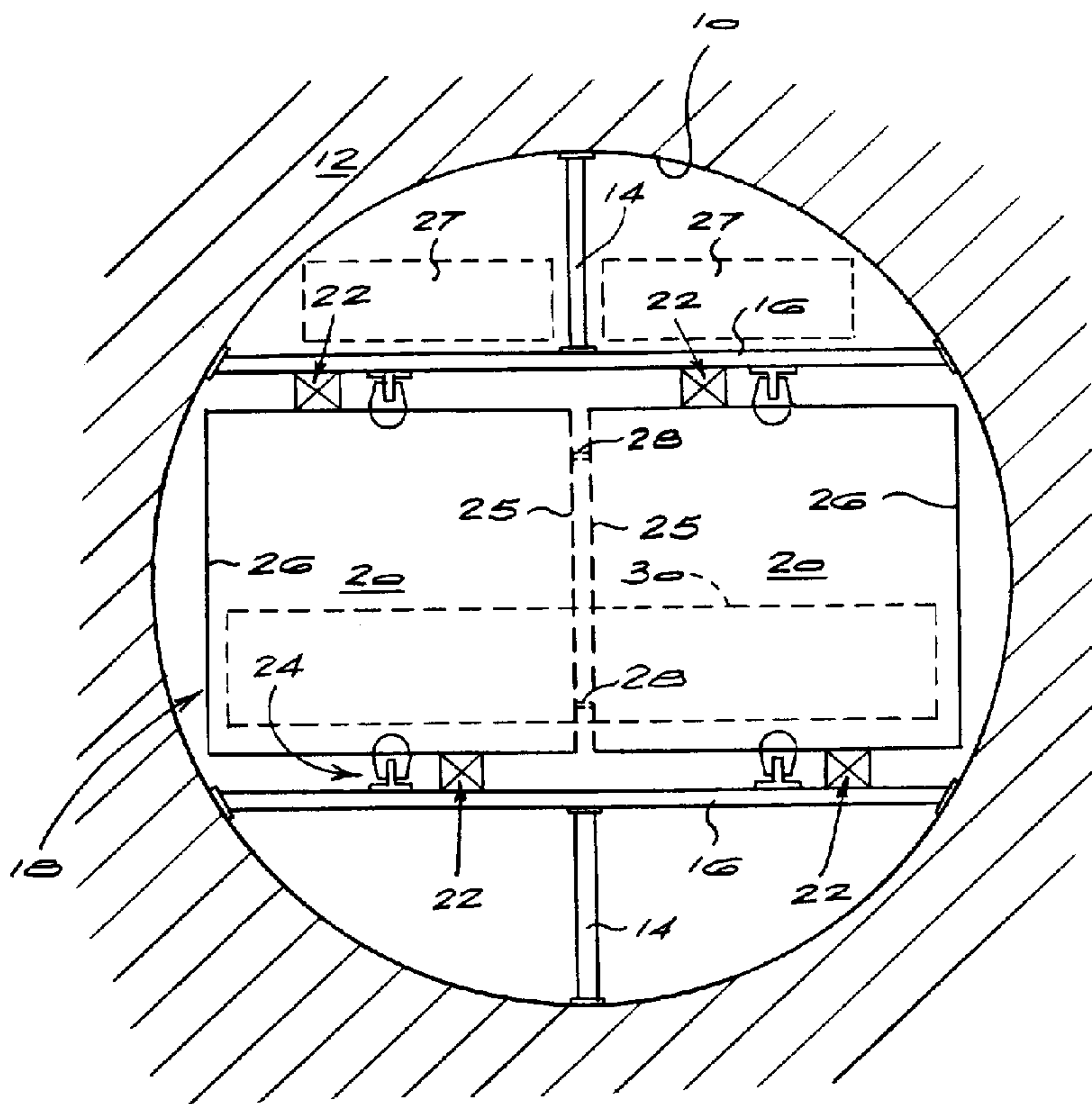
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(54) **SYSTEME D'ELEVATEURS D'EXTRACTION DE MINERAI**

(54) **SHAFT CONVEYANCE SYSTEM**



(57) The shaft conveyance system comprises a vertical shaft 10, shaft conveyances 18 and means 20 for moving the conveyances up and down the shaft, pairs or groups of the conveyances being connectable together in side-by-side relationship so as to move up or down the shaft together. The shaft is typically a mine shaft. The conveyances may be driven by linear motors.

ABSTRACT

The shaft conveyance system comprises a vertical shaft 10, shaft conveyances 18 and means 20 for moving the conveyances up and down the shaft, pairs or groups of the conveyances being connectable together in side-by-side relationship so as to move up or down the shaft together. The shaft is typically a mine shaft. The conveyances may be driven by linear motors.

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"SHAFT CONVEYANCE SYSTEM"

THIS invention relates to a shaft conveyance system.

In a traditional mine shaft, mine conveyances such as personnel cages and rock and material skips move vertically up and down the shaft on ropes. The shaft is effectively divided into pairs of compartments, one for accommodating a rising conveyance, and the other for accommodating a descending conveyance. The rope winding equipment is operated in such a way that as one conveyance rises, the other descends, the one conveyance thereby assisting the ascent or descent of its counterpart. The resultant counterbalancing of the loads reduces the nett power which needs to be delivered by the rope winding equipment.

The traditional mine shaft has vertical steelwork incorporating guide rails for the conveyances, and horizontal steelwork which spans across the shaft. The horizontal steelwork includes buntons which span diametrically across the shaft, effectively dividing it into separate sections in which the respective rising and descending conveyances move.

One of the problems associated with traditional mine shafts of the kind described is the fact that the efficiency and speed with which men, materials and rock can be transported into and out of the mine is dependent on the capacities of the conveyances. For instance, large machines may have to be taken underground in pieces and assembled in the mine, because the conveyances are not large enough to accommodate the assembled machine. Naturally, the disassembly of a machine at the surface and its subsequent assembly underground is highly labour intensive and inconvenient.

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A first aspect of the invention provides a shaft conveyance system comprising a vertical shaft, shaft conveyances and means for moving the conveyances up and down the shaft, pairs or groups of the conveyances being connectable together in side-by-side relationship so as to move up or down the shaft together. The shaft is typically, but not necessarily, a mine shaft.

The shaft may include supportwork defining a conveyance space in which the side-by-side, connected conveyances can move up or down the shaft together.

Various drive means for the conveyances are envisaged. For instance, such drive means could comprise a linear motor system, a rack and pinion system or a rope drive system.

A second aspect of the invention provides a method of moving an article up or down a vertical shaft equipped with shaft conveyances and means for moving the conveyances up and down the shaft, the method comprising the steps of connecting together, in side-by-side relationship, two or more of the conveyances, placing the conveyances in communication with one another so as to form a combined load space greater than the load space of a single one of the conveyances, loading the article into the combined load space, and moving the connected conveyances up or down the shaft.

A third aspect of the invention provides a mine shaft comprising a vertical shaft and supportwork in the shaft defining a vertically extending conveyance space having lateral dimensions large enough to accommodate at least two side-by-side mine conveyances moving up or down the shaft along spaced apart vertical paths, the supportwork being arranged in the shaft in such a manner that no part of the supportwork spans across the conveyance space, thereby allowing at least two conveyances to be connected side-by-side to one another for movement up or down

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the shaft together.

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawing which diagrammatically shows a typical horizontal cross-section through a mine shaft of the invention.

In the drawing the numeral 10 indicates a circular section mine shaft excavated in the surrounding rock 12 by conventional shaft sinking techniques. Inside the shaft 10 is steel supportwork consisting of members 14 and members 16 connected to one another and to the wall of the shaft. The members 16 define between them a conveyance space 18 which, in the present case, is large enough to accommodate two mine conveyances, typically rock or material skips or personnel cages 20, in side-by-side relationship.

It will be noted that there is no part of the shaft supportwork which actually spans across the conveyance space 18 between the members 16.

In the illustrated embodiment, the conveyances 20 are driven electromagnetically by linear motor configurations indicated generally with the numeral 22. A suitable linear motor drive arrangement is described in PCT/GB90/00335 to which reference may be made for the details. Thus the conveyances are effectively individually powered and the movement of one is not affected in any way by the other. This is in contrast to traditional mine shaft conveyance systems in which conveyances are suspended on steel ropes and moved up and down the shaft as required by winder apparatus located at the surface, and in which the forces imposed by the conveyances are balanced by causing one conveyance to move up the shaft while another conveyance is moving down the shaft. In the present case, there may be many conveyances at different elevations on each side of the conveyance space 18, the conveyances being at different elevations in the shaft 10.

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A further distinction offered by the illustrated configuration results from the fact that the conveyances are not only driven vertically up and down the shaft by the linear motor configurations 22, but are also guided, both by the electromagnetic forces themselves and by associated, vertically extending rail and guide arrangements, indicated generally at 24.

In alternative embodiments of the invention, the conveyances 20 may be driven by rack and pinion arrangements, or by rope winding equipment. In the latter case, counterweights 27 may be provided for each conveyance 20. Naturally in this particular embodiment, the necessary buntons can not span diametrically across the shaft 10, i.e. across the conveyance space 18, but are constituted by one or more of the members 16.

The conveyances are not guided at their side walls 25 and 26 by buntion-mounted guides as would be the case in a traditional winder-operated conveyance system. It is this fact which permits the shaft 10 to have no component of supportwork spanning across the conveyance space 18.

With the illustrated configuration it is possible for the mine conveyances 20 on either side of the space 18 to be connected side-by-side to one another so as to be moved up or down the shaft together. Connectors for this purpose are indicated schematically at 28. It is preferably possible for the sidewalls 25 of the conveyances 20 to be removed. The sidewalls may be in the form of doors which are able to open fully, such as roller doors. The doors are opened, or rolled back so that the side-by-side conveyances define a load volume which is effectively twice that afforded by a single conveyance 20. This in turn means that it would be possible to transport, into and out of the mine served by the shaft 10, large objects and items of machinery such as that indicated by diagrammatically by the numeral 30.

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It is an essential aspect of the invention that no supportwork occupies the conveyance space 18, so that there is no hindrance to the side-by-side connection of the conveyances 20 to one another.

Depending on the design of the shaft 10 and the arrangement of the supportwork, it may even be possible for the space 18 to be large enough to accommodate three or even more conveyances side-by-side. This would be advantageous for transporting extra-large objects and items of machinery into and out of the mine served by the shaft.

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THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:-

1.

A shaft conveyance system comprising a vertical shaft, shaft conveyances and means for moving the conveyances up and down the shaft, pairs or groups of the conveyances being connectable together in side-by-side relationship so as to move up or down the shaft together.

2.

A shaft conveyance system according to claim 1 wherein the shaft is a mine shaft.

3.

A shaft conveyance system according to claim 1 wherein the shaft includes supportwork defining a conveyance space in which the side-by-side, connected conveyances can move up or down the shaft together.

4.

A shaft conveyance system according to claim 1 wherein the means for moving a conveyance up and down the shaft comprises a linear motor.

5.

A shaft conveyance system according to claim 1 wherein the means for moving a conveyance up and down the shaft comprises a rack and pinion drive.

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6.

A shaft conveyance system according to claim 1 wherein the means for moving a conveyance up and down the shaft comprises a rope drive having a rope on which the conveyance is suspended and a rope winding drive.

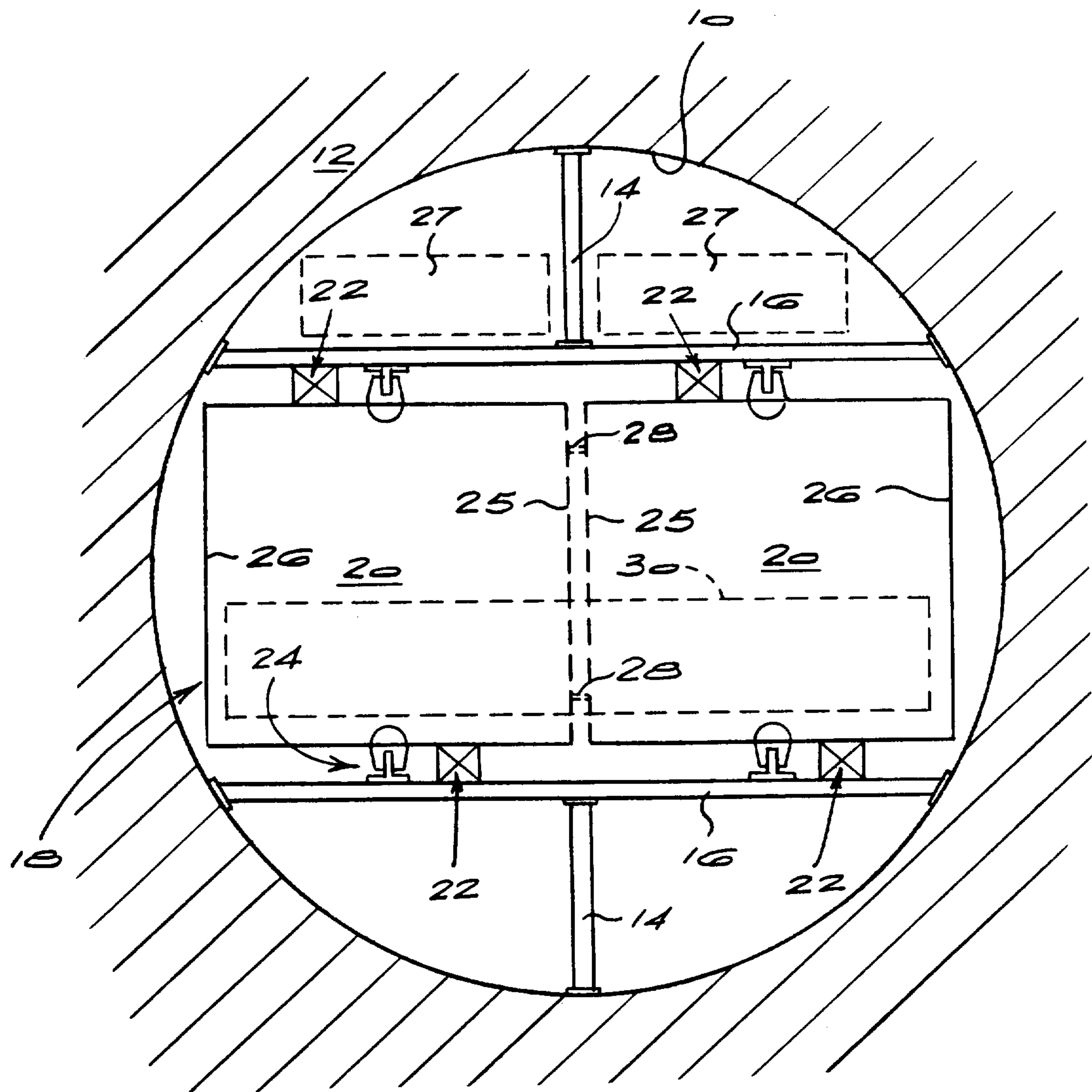
7.

A method of moving an article up or down a vertical shaft equipped with shaft conveyances and means for moving the conveyances up and down the shaft, the method comprising the steps of connecting together, in side-by-side relationship, two or more of the conveyances, placing the conveyances in communication with one another so as to form a combined load space greater than the load space of a single one of the conveyances, loading the article into the combined load space, and moving the connected conveyances up or down the shaft.

8.

A mine shaft comprising a vertical shaft and supportwork in the shaft defining a vertically extending conveyance space having lateral dimensions large enough to accommodate at least two side-by-side mine conveyances moving up or down the shaft along spaced apart vertical paths, the supportwork being arranged in the shaft in such a manner that no part of the supportwork spans across the conveyance space, thereby allowing at least two conveyances to be connected side-by-side to one another for movement up or down the shaft together.

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