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(54) SHEAVE ASSEMBLY FOR AN ELEVATOR SYSTEM

SCHEIBENKONSTRUKTION FÜR EIN AUFZUGSSYSTEM

TRAIN DE GALETS POUR SYSTEME D'ASCENSEUR

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(73) Proprietor: **OTIS ELEVATOR COMPANY**
Farmington, CT 06032 (US)

(72) Inventors:
- **DET, Franck**
  F-45500 St. Martin/Ocre (FR)
- **DUPEE, Davy**
  F-45500 Gien (FR)
- **CLOUX, Jean-Noel**
  F-45290 Nogent sur Vernisson (FR)
- **BEEUWSAERT, Michel**
  F-45500 Nevoy (FR)
- **PICARD, Raphael**
  F-45500 Gien (FR)
- **REBILLARD, Pascal**
  F-45500 Gien (FR)
- **RICO, Fernando**
  F-92500 Rueil Malmaison (FR)
- **PILLIN, David**
  F-29490 Guipavas (FR)
- **FANIELLE, Hugues**
  F-45000 Orleans (FR)
- **LEGEZ, Jacobus, Benjamin**
  NL-1424 SC DE Kwakel (NL)

(74) Representative: **Leckey, David Herbert et al**
Frank B. Dehn & Co.
St Bride's House
10 Salisbury Square
London EC4Y 8JD (GB)

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Description

BACKGROUND OF THE INVENTION

[0001] This invention generally relates to elevator systems and more specifically to a space efficient elevator system including a guide rail mounted machine and a sheave design that accommodates the guide rail.

[0002] Elevator systems typically include a car and counterweight that move within a hoistway. Roping couples the car and counterweight and supports them as they move. A motor drives the rope to raise and lower the car. Typically, the car includes a roller assembly that cooperates with a guide rail to guide the car within the hoistway. Traditionally, the motor has been mounted within a machine room disposed at the top of the hoistway.

[0003] Idler sheaves disposed on the elevator car, for example, form part of a system of roping for raising and lowering the car along with the counterweight. Roping is threaded through idler sheaves at various location in the system, for example, the elevator car and counterweight. The idler sheaves necessarily take up space within the hoistway and the guide rail extends from the interior surface of the hoistway walls toward the elevator car. Various machine mounting strategies have been proposed but building and safety codes require sometimes expensive devices and controls.

[0004] Recently, machine room-less elevator systems have been developed that no longer require a separate machine room. Machine room-less elevator systems were developed in response to consumer demands for simpler, more efficient use of space dedicated to elevator systems. Even with such systems, there still is need to decrease the space occupied by an elevator system.

[0005] It is desirable to minimize system expenses to conserve hoistway space and allow for easy installation of the elevator car within the hoistway. Further, buildings typically arc not designed to make special accommodations for elevator systems.

[0006] For these reasons it is desirable to design an elevator system adaptable to efficiently utilize hoistway space. This invention addresses these needs.

[0007] DE-A-1032496 discloses an elevator drive system with guide rollers mounted underneath the car.

[0008] US-A-20020070080 discloses an elevator having cage-side sheaves disposed at four positions on the lower portion of the cage.

[0009] In general terms this invention seeks to provide an elevator system having a unique sheave arrangement that accommodates a portion of a guide rail, requires less space within a hoistway and allows more versatility in arranging the components in the system.

[0010] An elevator system according to this invention is defined in claim 1.

[0011] Accordingly, the inventive arrangement of system components provides a more efficient, space saving elevator system.

[0012] The various features and advantages of this invention will become apparent to those skilled in the art from the following detailed description of the currently preferred embodiments. The drawings that accompany the detailed description can be briefly described as follows:

Figure 1 schematically shows an elevator system designed according to this invention;
Figure 2 is a side view of an elevator car including guide rollers and idler sheave assemblies;
Figure 3 is a top view of the elevator car and counterweight;
Figure 4 is an enlarged view of the idler sheave assembly of the elevator car and counterweight;
Figure 5 is an enlarged view of the roller assembly of the elevator car and the sheave assemblies on the counterweight; and
Figure 6 is an enlarged view of another embodiment of the idler sheave assembly.

DETAILED DESCRIPTION OF THE PREFERRED EMODIMENTS

[0013] Referring to Figures 1 and 2, an embodiment of this invention is an elevator system 10 including an elevator car 12 supported for movement within a hoistway 14. The hoistway 14 includes guide rails 38 positioned on an interior wall 24 of the hoistway 14 and mounted to counter-weight brackets 56. The counter-weight brackets 56 are mounted to an opposite interior wall 26. The guide rails 38 guide movement of the elevator car 12 within the hoistway 14. The counter-weight bracket 56 provides a space extending the entire height 42 of the hoistway 14 for movement of a counter-weight 22.

[0014] The counterweight 22 moves when the elevator car 12 moves as known. The counterweight 22 is guided by guide rails 40 mounted within the hoistway (shown in Figure 3). The elevator car 12 and counterweight 22 include sheave assemblies 32, 34 that cooperate with roping 36 and a machine 16 to raise and lower the elevator car 12. In the illustrated example the sheave assemblies 32 are mounted to a base 48 of the elevator car 12, however, it is within the contemplation of this invention that the sheave assemblies 32 may be mounted on other locations on the elevator car 12 as may be needed as are known to a worker skilled in the art. The elevator car 12 also includes roller assemblies 28, 30 disposed on a top and bottom of the elevator car 12 that ride along the guide rails 38 maintaining proper alignment of the elevator car 12.

[0015] The machine 16 of the example elevator system 10 is positioned and supported atop at least one of the guide rails 38, 40. Supporting the machine 16 atop the guide rails 38,40 eliminates the need for a separate machine room required in conventional elevator systems. The machine room-less elevator system 10 is designed to efficiently use hoistway space 14 and eliminate the

requirement of a separate machine room. Using a guide rail to support the machine 16 provides the further advantage of minimizing the number of components.

[0016] The elevator system 10 optimizes space use within the hoistway 14. The inventive approach allows the guide rails 38 to be positioned as close to the elevator car 12 as is possible. The sheave assemblies 32 include a spacing 62 between profiled belt engaging portions 54, allowing the guide rails 38 to extend closer to the elevator car 12.

[0017] The sheave assemblies 32 are disposed on the base 48 of the elevator car 12 and at least two belts 36 thread about the idler sheave assemblies disposed on either side of the elevator car 12 and are fixed at one end to a dead end hitch 18 mounted atop one of the guide rails 38. The other end of each belt 36 is fixed to dead end hitch 20 mounted atop the guide rail 38 with the machine 16 after threading through the idler sheave assembly 34 of the counterweight 22 and over the machine 16. The illustrated configuration of roping is only one type and it should be understood that other configurations of hoistway roping for raising and lowering the elevator car 12 are within the contemplation of this invention.

[0018] Referring to Figure 3, each of the guide rails 38 includes a mount portion 64 mounted to the interior wall 24 or to the counter-weight bracket 56. Extending from the rail mount 64 is a guide portion 66. The guide portion 66 cooperates with the roller assemblies 28,30 as known. Space within the hoistway 14 is conserved by allowing the guide portion 66 of the guide rails 38 to extend toward the car 12 beyond the belt engaging surfaces on the sheave portions 54 of the sheave assemblies 32. Extending the guide portion 66 of each guide rail 38 between sheaves 54 of the sheave assembly 32 reduces the amount of space utilized for components of the elevator system 10 to conserve space within the hoistway 14.

[0019] The example sheave assembly 32 includes four individual sheave portions 54 supported about a common shaft 50. A spacing 62 separates the sheave portions 54 into two separate groups of two idler sheave portions 54. Each of the idler sheave portions 54 includes an outer diameter 74 (Figure 4). Some of the guide portion 66 of each guide rail 38 extends into the spacing 62 between a plane 72, tangent to the outer diameter 74 of the sheave portions 54, and the shaft 50. The spacing 62 has a smaller outside dimension than the outside diameter 74 of the sheave portions. In the illustrated example, the outer dimension of the shaft 50 establishes this smaller outside dimension.

[0020] Referring to Figure 4, the shaft 50 is supported by the support member 52 attached to the elevator car 12. Each of the sheaves 54 includes the outer diameter 74. The outer diameter 74 is spaced a first distance 75 from the axis of rotation 58. The guide portion 66 of the guide rail 38 is spaced from the axis of rotation a second distance 77. The second distance 77 is less then the first distance 75 such that a portion of the guide rail is within the spacing 62 between sheave portions. In other words, the plane 72 tangent to the outer diameter 74 of the sheave portions 54 extends across the spacing 62 and at least a portion of the guide 66 of the guide rail 38 intersects the plane 72.

[0021] Referring to Figure 5, the guide rail 38 engages the roller assembly 28 of elevator car 12. The ropes 36 are shown in relative position to the guide rail 38 and roller assembly 28. The plane 72 tangent with the outer diameter 74 of the sheaves 54 is shown relative to the ropes 36 and intersects a portion of the guide rail 38. Mounting the idler sheave assemblies 32 to create the spacing 62 through which the guide portion 66 can extend provides increased space for use by the elevator car 12 and efficiently allocates precious and valuable space within the hoistway 14. The increased space within the hoistway 14 provided by this invention accommodates consumer demands for efficient use of hoistway space.

[0022] Referring to Figure 4, an enlarged view is shown of the sheave assembly 32. The sheave portions 54 are supported about the axis 58 by the common shaft 50 and includes bearing assemblies 60 mounted within each sheave portion 54. The bearing assemblies 60 may be of any type known to a worker skilled in the art. In this embodiment, two sheave portions 54 are shown on either side of the guide rail 38 along with corresponding roping 36.

[0023] Referring to Figure 6, another embodiment of the sheave assembly is shown including three idler sheave portions 54 on each side of the spacing 62. The number of sheave portions 54 disposed on either side of the guide rail 38 is application specific and may include two, three, four, or any combinations thereof as required by specific application requirements.

[0024] The counterweight 22 includes sheave assemblies 34 similar to the sheave assemblies 32 mounted on the elevator car 12. The guide rails 40 for the counterweight 22 do not extend between the sheave portions 54 of the sheave assembly 34 mounted on the counterweight 22 in this example.

[0025] The foregoing description is exemplary and not just a material specification. The invention has been described in an illustrative manner, and it should be understood that the terminology used is intended to be in the nature of words of description rather than of limitation. Modifications and variations are possible in light of the above teachings. The preferred embodiments of this invention have been disclosed, however, one of ordinary skill in the art would recognize that certain modifications are within the scope of this invention. It is to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described. For that reason the following claims should be studied to determine the true scope and content of this invention.

Claims

1. An elevator system comprising;
at least one rail (38);
a car (12) that is selectively movable along said rail (38); and
a sheave assembly (32) supported on the car (12) having at least two sheave portions (54) with a spacing (62) between the portions (54), said rail (38) extending into the spacing (62); and **characterised in that** said at least two sheave portions (54) are supported on a common shaft (50) for rotation about a common axis (58).

2. The system of claim 1, wherein each of said sheave portions (54) includes an outer periphery having a first outside radial dimension (74), and said spacing (62) between said portions (54) having a second, smaller outside radial dimension.

3. The system of claim 1 or 2, wherein said sheave portions (54) each comprises a separate member on either side of said spacing (62).

4. The system of claim 3, including a plurality of separate members disposed on either side of said rail (38).

5. The system of any preceding claim, wherein said hoistway includes first and second rails (38) disposed on opposite sides of said car (12) and a first said sheave assembly (32) disposed one side of said car (12) and a second sheave assembly (32) disposed on an opposite side of said car (12).

6. The system of any preceding claim, including a machine (16) mounted on said rail (38).

7. The system of any preceding claim, including a counterweight (22) having a sheave assembly (34) having at least two sheave portions (70) rotatable about a common axis with a spacing between the portions (70).

8. The system of claim 7, including a common shaft (68) supporting said at least two sheave portions (70) of said counterweight (22).

9. The system of claim 7, including separate shafts supporting said at least two sheave portions (70) of said counterweight (22).

10. The system of claim 7, 8 or 9 including a combined bracket (56) supporting at least one of said rails (38) for said car (12) and rails (40) for said counterweight (22).

11. The system of any preceding claim, wherem said sheave assemblies (32) are mounted to a bottom portion of said car (12).

12. The system of any of claims 1-10, wherein said sheave assemblies (32) are mounted to a top portion of said car (12).

13. The system of any preceding claim, including a guide assembly (28, 30) mounted to said car (12) and engaged to said rail (38) for guiding said car (12).

Patentansprüche

1. Aufzugsystem, aufweisend:

mindestens eine Schiene (38);
einen Fahrkorb (12), welcher sich selektiv entlang der Schiene (38) bewegen lässt; und
eine an dem Fahrkorb (12) befestigte Seilscheibenanordnung (32) mit mindestens zwei Seilscheibenteilen (54) mit einem Raum (62) zwischen den Teilen (54), wobei sich die Schiene (38) in den Raum (62) erstreckt;

und **dadurch gekennzeichnet, dass** die mindestens zwei Seilscheibenteile (54) um eine gemeinsame Achslinie drehbar auf einer gemeinsamen Achse (50) getragen sind.

2. System nach Anspruch 1, wobei jeder der Seilscheibenteile (54) einen äußeren Umfang mit einer ersten äußeren radialen Abmessung (74) aufweist und der Raum (62) zwischen den Teilen (54) eine zweite kleinere äußere radiale Abmessung aufweist.

3. System nach Anspruch 1 oder 2, wobei jeder Seilscheibenteil (54) ein separates Element auf einer Seite des Raums (62) aufweist.

4. System nach Anspruch 3, aufweisend eine Mehrzahl von separaten Elementen, welche auf jeder Seite der Schiene (38) angeordnet sind.

5. System nach einem der vorhergehenden Ansprüche, wobei der Schacht eine erste und zweite Schiene (38) aufweist, die an entgegengesetzten Seiten des Fahrkorbs (12) angeordnet sind, und eine erste Seilscheibenanordnung (32), welche an einer Seite des Fahrkorbs (12) angeordnet ist, und eine zweite Seilscheibenanordnung (32), welche an einer entgegengesetzten Seite des Fahrkorbs (12) angeordnet ist.

6. System nach einem der vorhergehenden Ansprüche, aufweisend eine Maschine (16), welche auf der Schiene (38) angebracht ist.

7. System nach einem der vorhergehenden Ansprüche, aufweisend ein Gegengewicht (22) mit einer Seilscheibenanordnung (34) mit mindestens zwei Seilscheibenteilen (70), welche um eine gemeinsame Achslinie drehbar sind, mit einem Raum zwischen den Teilen (70).

8. System nach Anspruch 7, aufweisend eine gemeinsame Achse (68), welche die mindestens zwei Scheibenteile (70) des Gegengewichts (22) trägt.

9. System nach Anspruch 7, aufweisend separate Achsen, welche die mindestens zwei Seilscheibenteile (70) des Gegengewichts (22) tragen.

10. System nach Anspruch 7, 8 oder 9, aufweisend einen kombinierten Halter (56), welcher mindestens eine Schiene von den Schienen (38) für den Fahrkorb (12) und den Schienen (40) für das Gegengewicht (22) hält.

11. System nach einem der vorhergehenden Ansprüche, bei welchem die Seilscheibenanordnungen (32) an einem Bodenbereich des Fahrkorbs (12) befestigt sind.

12. System nach einem der Ansprüche 1 bis 10, bei welchem die Seilscheibenanordnungen an einem oberen Bereich des Fahrkorbs (12) befestigt sind.

13. System nach einem der vorhergehenden Ansprüche, aufweisend eine Führungsanordnung (28, 30), welche an dem Fahrkorb (12) befestigt ist und mit der Schiene (38) zusammenwirkt, um den Fahrkorb (12) zu führen.

Revendications

1. Système d'ascenseur comprenant :

au moins un rail (38) ;
une cabine (12) qui peut être sélectivement déplacée le long dudit rail (38) ; et
un train de galets (32) supporté sur la cabine (12) ayant au moins deux parties de galets (54) avec un espacement (62) entre les parties (54), ledit rail (38) s'étendant à l'intérieur de l'espacement (62) ; et

caractérisé en ce que lesdites au moins deux parties de galets (54) sont supportées sur un arbre commun (50) pour tourner autour d'un axe commun (58).

2. Système selon la revendication 1, dans lequel chacune desdites parties de galets (54) comprend une périphérie externe ayant une première dimension radiale extérieure (74) et ledit espacement (62) entre lesdites parties (54) ayant une seconde dimension radiale extérieure, plus petite.

3. Système selon la revendication 1 ou 2, dans lequel lesdites parties de galets (54) comprennent chacune un élément séparé sur chaque côté dudit espacement (62).

4. Système selon la revendication 3, comprenant une pluralité d'éléments séparés disposés sur chaque côté dudit rail (38).

5. Système selon l'une quelconque des revendications précédentes, dans lequel ledit puits comprend un premier et un second rails (38) disposés sur les côtés opposés de ladite cabine (12) et un premier dit train de galets (32) disposé sur un côté de ladite cabine (12) et un second train de galets (32) disposé sur un côté opposé de ladite cabine (12).

6. Système selon l'une quelconque des revendications précédentes, comprenant une machine (16) montée sur ledit rail (38).

7. Système selon l'une quelconque des revendications précédentes, comprenant un contrepoids (22) ayant un train de galets (34) ayant au moins deux parties de galets (70) pouvant tourner sur un axe commun avec un espacement entre les parties (70).

8. Système selon la revendication 7, comprenant un arbre commun (68) supportant lesdites au moins deux parties de galets (70) dudit contrepoids (22).

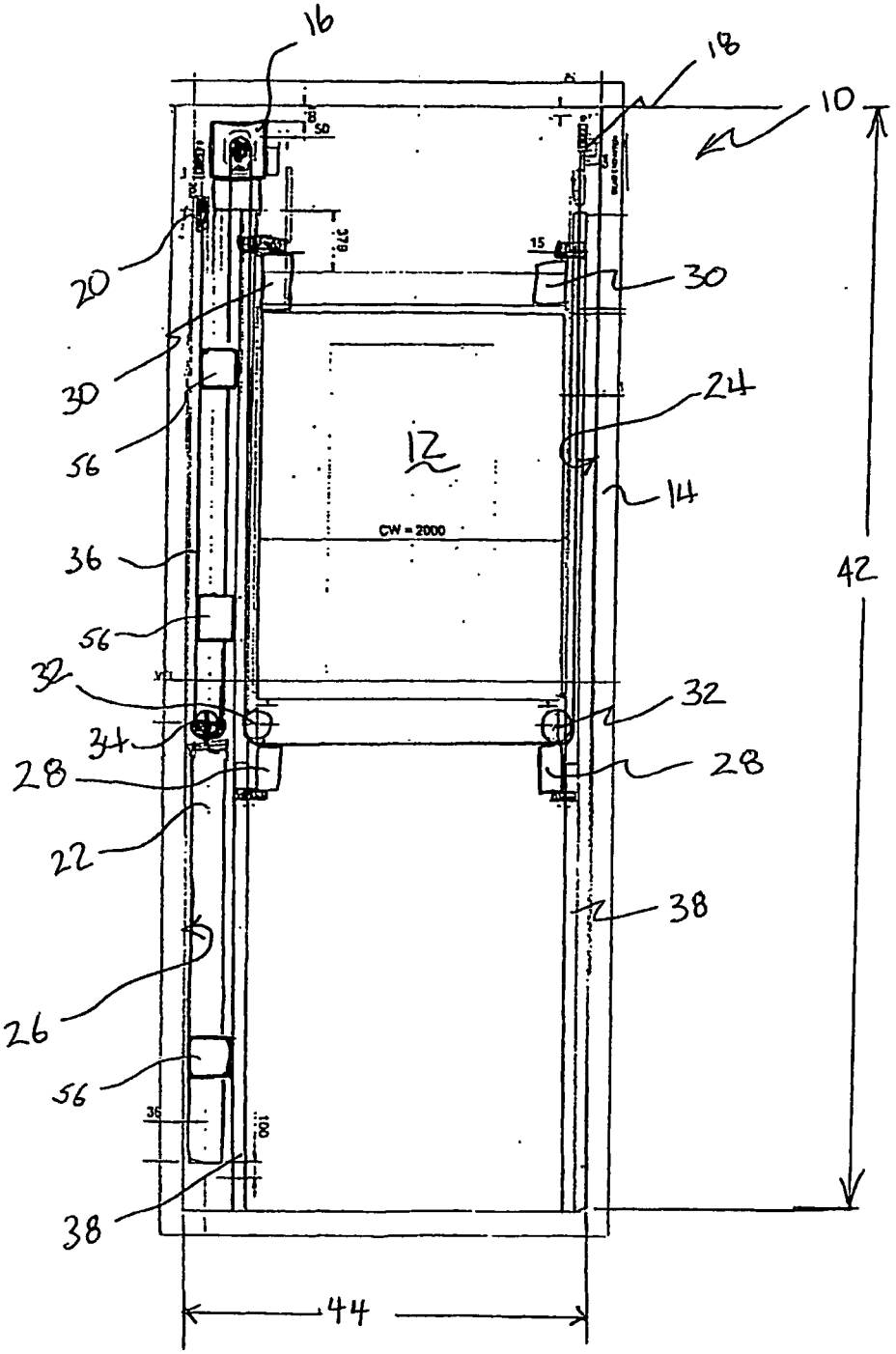
9. Système selon la revendication 7, comprenant des arbres séparés supportant lesdites au moins deux parties de galets (70) dudit contrepoids (22).

10. Système selon la revendication 7, 8 ou 9, comprenant un support combiné (56) supportant au moins un desdits rails (38) pour ladite cabine (12) et des rails (40) pour ledit contrepoids (22).

11. Système selon l'une quelconque des revendications précédentes, dans lequel lesdits trains de galets (32) sont montés sur une partie inférieure de ladite cabine (12).

12. Système selon l'une quelconque des revendications 1 à 10, dans lequel lesdits trains de galets (32) sont montés sur une partie supérieure de ladite cabine (12).

13. Système selon l'une quelconque des revendications précédentes, comprenant un montage de guidage (28, 30) monté sur ladite cabine (12) et mis en prise avec ledit rail (38) pour guider ladite cabine (12).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56
38
44

FIG 1

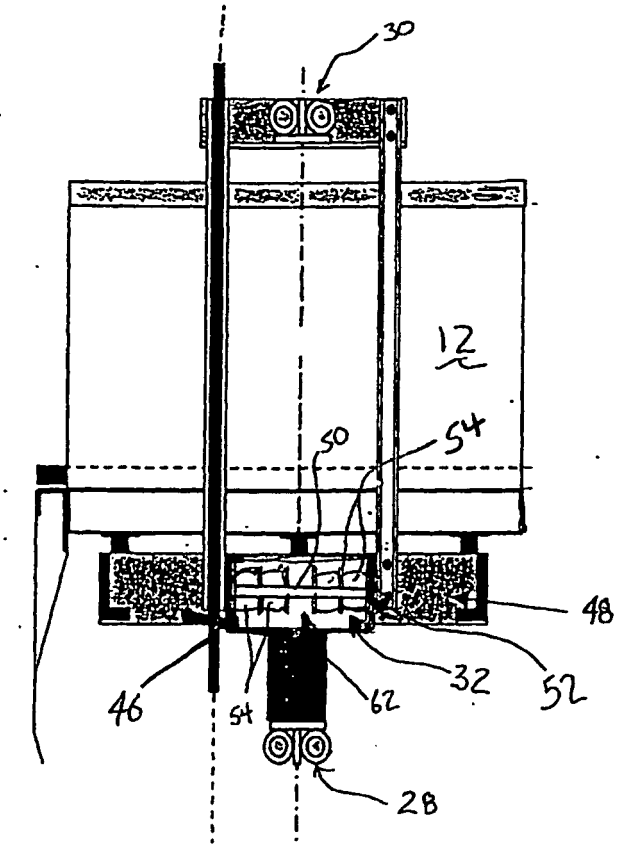


Fig 2

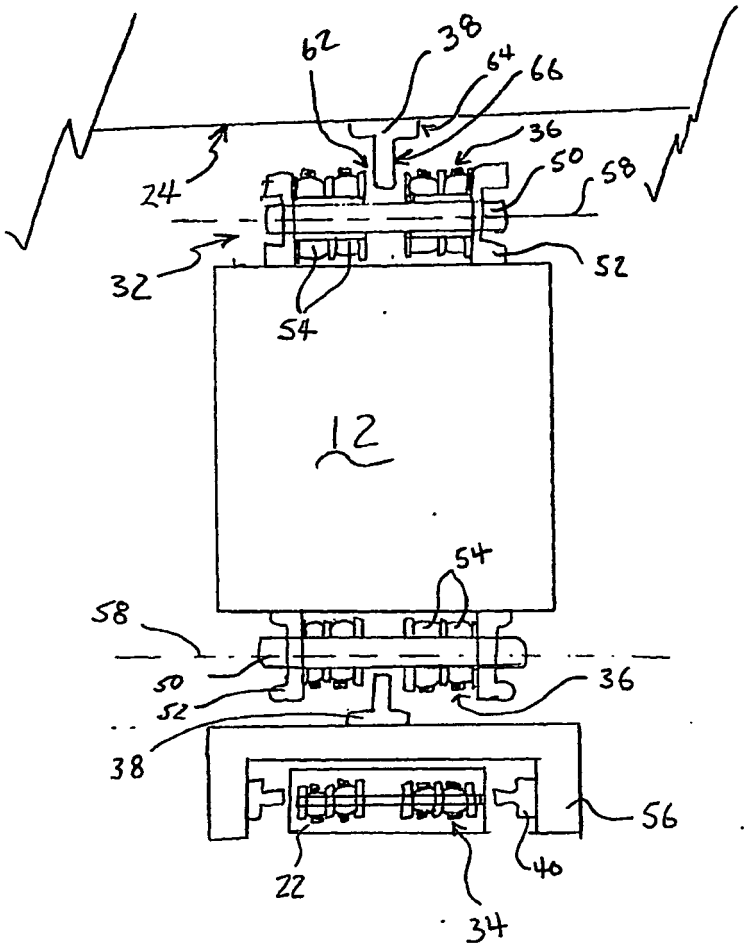
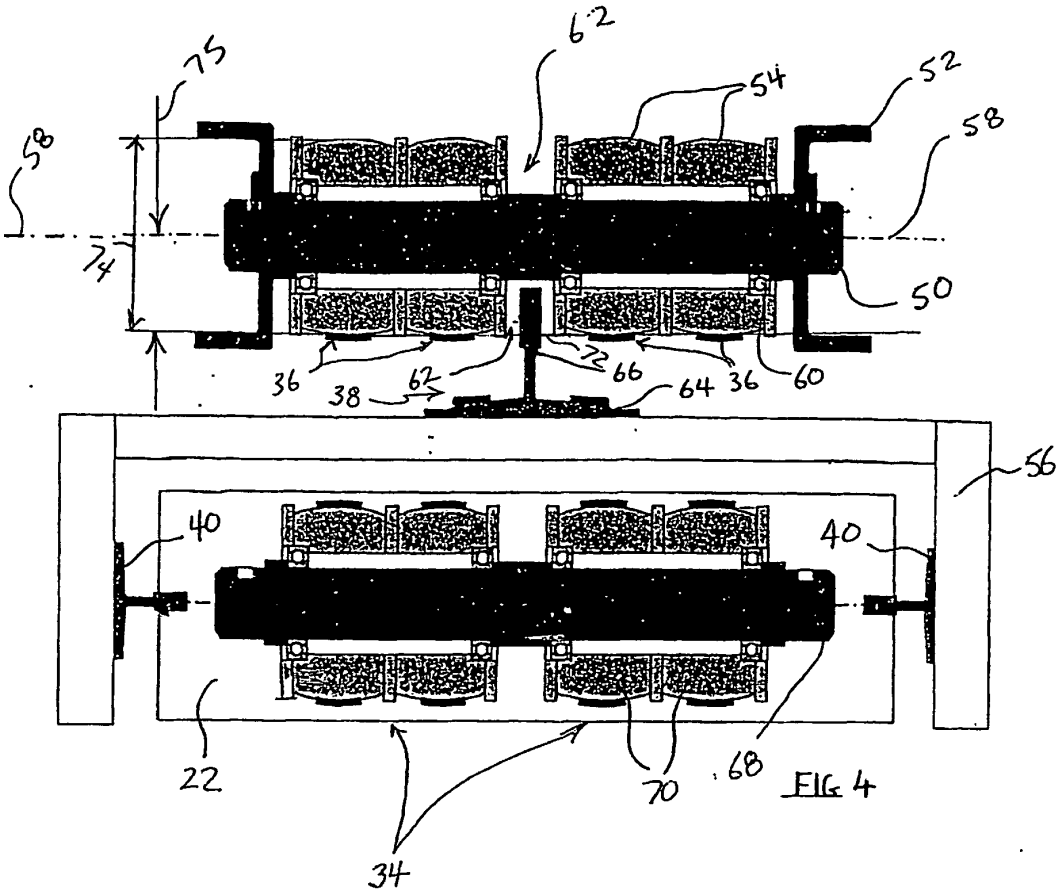


FIG 3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52
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74
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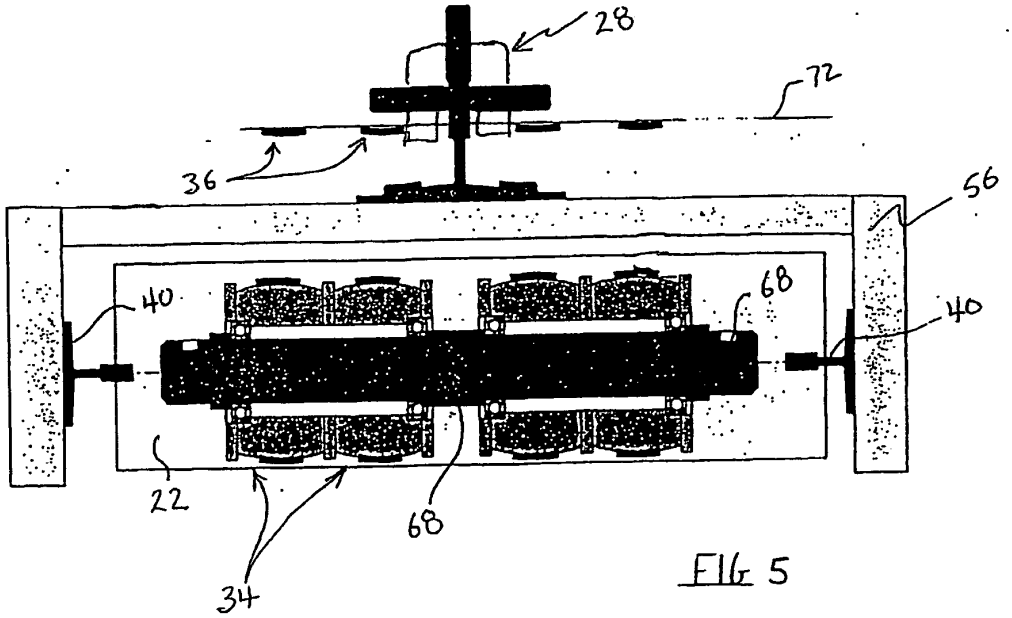
22
70
68
34

FIG 4


28
72
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40
68
40
22
68
34

FIG 5

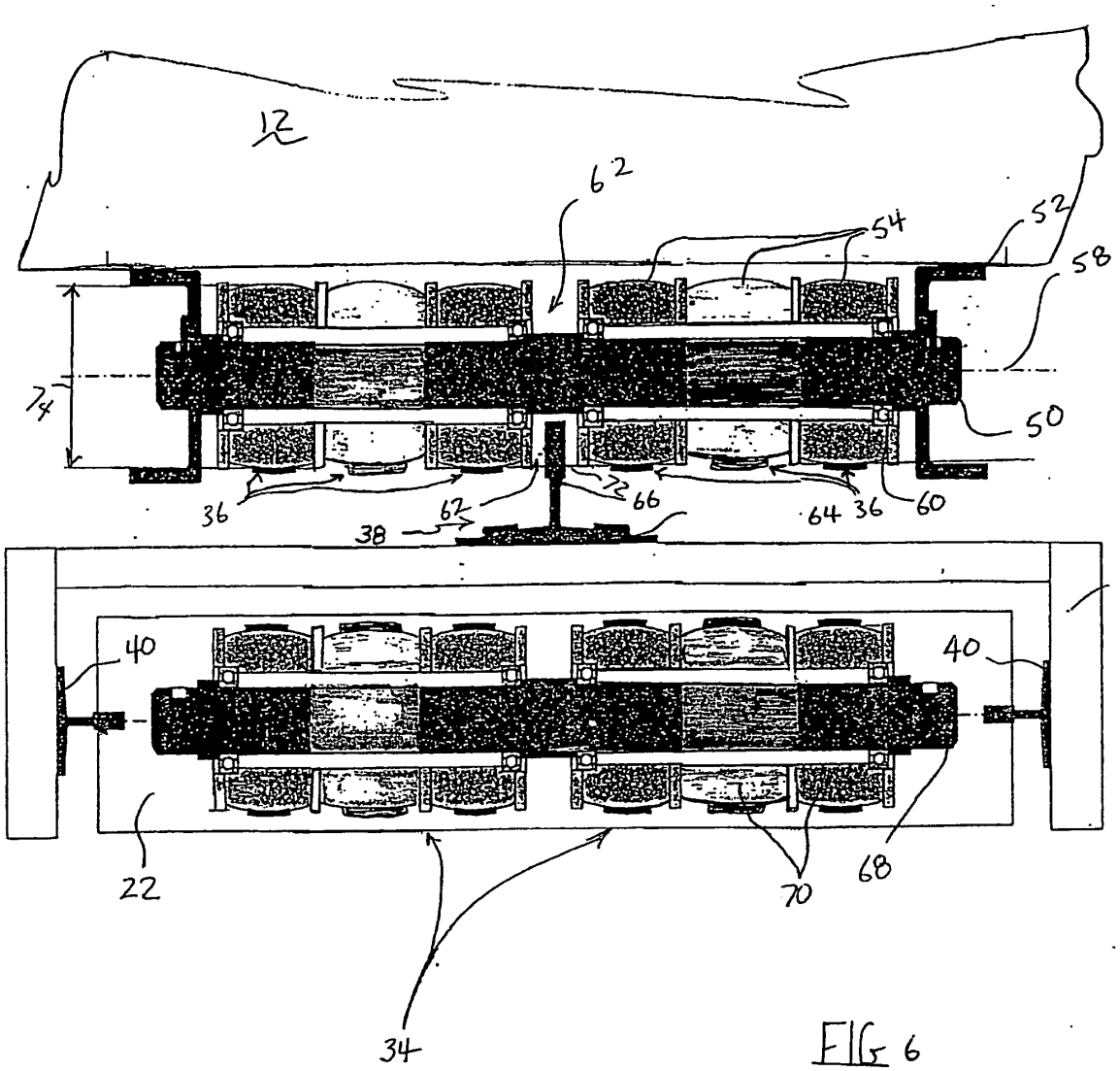

FIG 6