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(54) **Cableway system with supporting cables and a separate haulage cable**

(57) In a cableway system (2) with supporting cables and a separate haul cable, a trolley (8), supporting a passenger car (8a) is moved along two taut supporting cables (7) by a haul- cable drive (12) having two drive pulleys (14), two return pulleys (15), and a haul cable (18) wound about the two drive pulleys (14) and return pulleys (15); the haul-cable drive (12) having two idle pulleys (21) fitted to the trolley (8) and about which is wound the intermediate portion (22) of the haul cable (18) extending between the drive pulleys (14), and also having a retaining device (20) for fixing firmly to the trolley (8) the end portions (18a,18b) of the haul cable (18) extending from the return pulleys (15) towards the trolley (8).

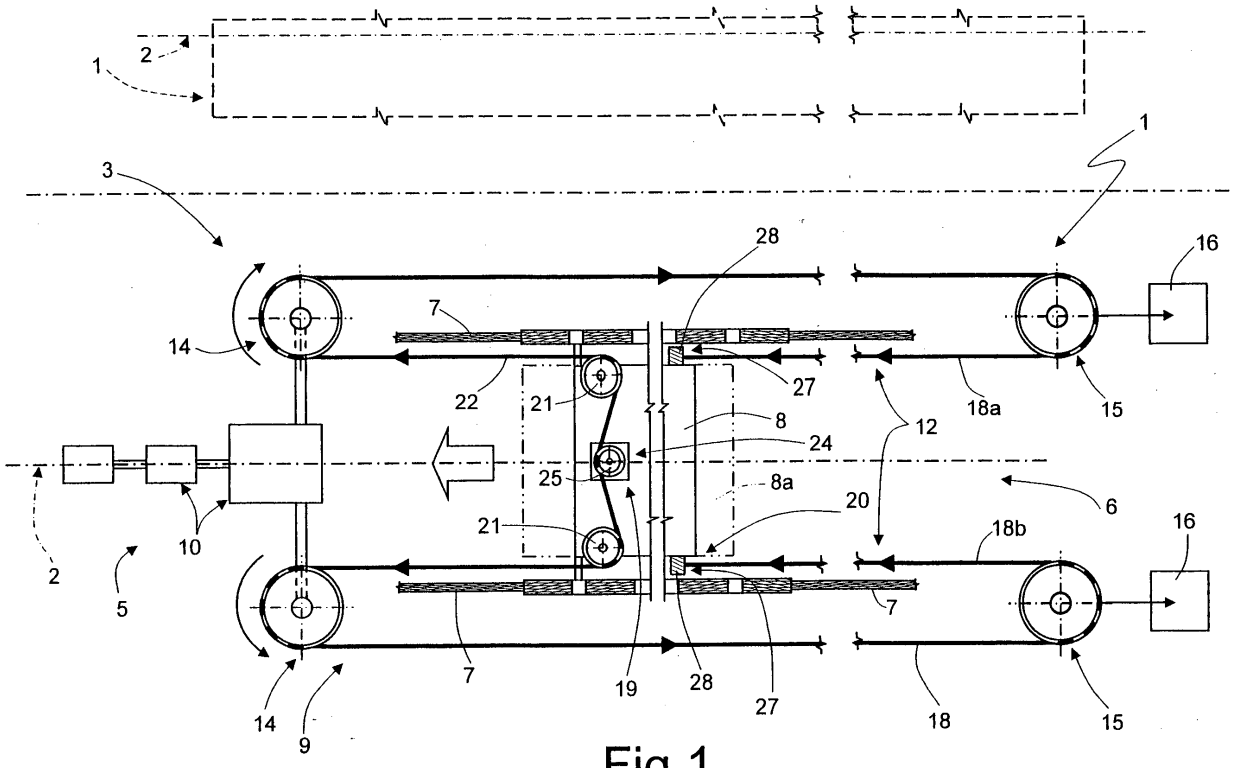


Fig.1

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Description

[0001] The present invention relates to a cableway system with supporting and haul cables.

[0002] More specifically, the present invention relates to a cableway system of the type described in HOELZL COSTRUZIONE FUNIVIE S.R.L. Patent EP 0 692 418 B1 granted on 24.11.1999, and comprising two supporting cables spaced a given distance apart and secured at opposite ends; a trolley fitted to the supporting cables; and a haul-cable drive interposed between an actuating unit and the trolley to move the trolley in opposite directions along the supporting cables.

[0003] The haul-cable drive comprises two drive pulleys powered by the actuating unit and located at a drive station; two return pulleys located at a return station; an endless haul cable looped about the two drive pulleys and two return pulleys; a first pair of idle pulleys fitted to the trolley and about which is looped the intermediate portion of the haul cable extending between the drive pulleys; and a second pair of idle pulleys, also fitted to the trolley, and about which is looped the intermediate portion of the haul cable extending between the return pulleys.

[0004] Known solutions of the type described above have several drawbacks, foremost of which is that of requiring not only an endless but also a "constant-strength" or "seamless" haul cable, in which the splice is practically invisible and poses no problems when winding on and off the pulleys, because the break load of the haul cable is practically the same at any point along it. Obtaining splices with the above characteristics is not easy, and involves painstaking work that can only be carried out on site by highly skilled personnel, thus resulting in high cost in terms of time and labour.

[0005] To this must be added additional comparable time and labour costs, on account of the haul cable, during operation of the system, settling and stretching, so that the first splice must inevitably be followed by cutting and further splicing.

[0006] It is an object of the present invention to provide a cableway system with supporting and haul cables, differing from existing systems, and designed to provide a straightforward, low-cost solution to the above problems.

[0007] According to the present invention, there is provided a cableway system with supporting and haul cables, comprising at least one pair of supporting cables located a given distance apart and secured at opposite ends, a trolley fitted to said supporting cables, and a haul-cable drive interposed between an actuating unit and said trolley to move the trolley in opposite directions along said supporting cables; the haul-cable drive comprising two drive pulleys connected to said actuating unit and located at a drive station, two return pulleys located at a return station, and a haul cable wound about the two drive pulleys and the two return pulleys; the haul-cable drive also comprising relative-mobility means interposed between said trolley and an intermediate portion of said haul cable extending between said drive pulleys, to permit relative movement of said intermediate portion with respect to said trolley; and the system being characterized in that said haul-cable drive also comprises retaining means carried by said trolley to fix firmly to the trolley the portions of said haul cable extending from said return pulleys towards said trolley.

[0008] A non-limiting embodiment of the invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic view of a preferred embodiment of the cableway system according to the present invention;

Figure 2 shows schematically, with parts removed for clarity, a first variation of a detail in Figure 1;

Figure 3 shows a side view, with parts sectioned for clarity, of a detail in Figure 2;

Figure 4 is similar to Figure 2, and shows schematically, with parts removed for clarity, a second variation of a detail in Figure 1;

Figure 5 is similar to Figure 4, and shows schematically, with parts removed for clarity, a variation of a detail in Figure 4;

Figure 6 shows a larger-scale detail of Figures 4 and 5.

[0009] Number 1 on Figure 1 indicates as a whole a cableway system with supporting and haul cables.

[0010] System 1 may be used on its own to form a single cable track 2, or, conveniently, alongside an identical cableway system 1 to form a two-cable tracks, i.e. to and fro cableway system 3 only shown partly in Figure 1.

[0011] System 1 comprises a drive station 5; a return station 6; two parallel supporting cables 7 spaced a given distance apart and secured at one end at drive station 5, and at the other end at return station 6; a known trolley 8 fitted to supporting cables 7 (Figures 1 and 3); a passenger car 8a suspended from trolley 8; and a haul-cable actuating unit 9 for moving trolley 8 in opposite directions along supporting cables 7.

[0012] Actuating unit 9 comprises a known motor reducer 10 at drive station 5; and a haul-cable drive 12 interposed between trolley 8 and motor reducer 10.

[0013] With reference to Figure 1, haul-cable drive 12 comprises two drive pulleys 14 located at drive station 5 and connected in known manner to motor reducer 10; two return pulleys 15 located at return station 6, and each connected to a respective counterweight 16 for moving the respective return pulley 15 away from the corresponding drive pulley 14; an open haul cable 18 wound about the two drive pulleys 14 and the two return pulleys 15, as shown in Figure 1; and two connecting devices 19 and 20 fitted to trolley 8 to connect haul cable 18 to trolley 8.

[0014] Device 19 is located on the side of trolley 8 facing drive pulleys 14, and comprises two idle pulleys 21

fitted in fixed positions and in rotary manner to trolley 8, and about which winds a continuous intermediate portion 22 of haul cable 18 extending between drive pulleys 14. In actual use, idle pulleys 21 permit relative movement of intermediate portion 22 with respect to trolley 8.

[0015] With reference to Figure 1, device 19 also comprises a known sense-pulley unit 24 located between idle pulleys 21 and comprising an idle pulley 25, which rotates about an axis parallel to those of idle pulleys 21, and is forced against portion 22 extending between pulleys 21, so as to curve part of portion 22 towards drive station 5. Unit 24 determines any variation in the tension of portion 22, and transmits a control signal to a known brake unit (not shown) for locking trolley 8 on haul cables 7.

[0016] Alternatively, in a variation not shown, each idle pulley 21 is replaced by a respective number of side by side rollers with axes parallel to one another and to the axis of pulley 25, or by a slide member defining a curved slide and guide track, on which part of intermediate portion 22 slides.

[0017] With reference to Figure 1, unlike device 19, device 20 is a retaining device, by which the two free end portions 18a, 18b of haul cable 18 from return pulleys 15 are connected firmly to trolley 8 to prevent any relative movement between portions 18a, 18b and trolley 8.

[0018] In the Figure 1 embodiment, device 20 comprises, for each free end portion 18a, 18b, a joint 27 interposed between relative portion 18a, 18b and a bracket 28 fitted integrally to trolley 8.

[0019] Alternatively, in the Figure 2 and 3 variation, device 20 comprises, for each end portion 18a, 18b, a respective drum 29, which is fitted integrally to trolley 8 with its axis conveniently parallel to those of pulleys 21 and 25, is located next to relative idle pulley 21, and is wound with an intermediate portion 29a of relative end portion 18a, 18b, the end portion 30 of which is secured to trolley 8 by a respective known clamp 31 not described in detail. Intermediate portions 29a are conveniently wound several times about respective drums 29 to form an "intermediate store" of standby cable for use during routine maintenance of system 1 (Figure 3).

[0020] In the Figure 4 variation, each drum 29 is replaced by a respective fixed guide member 34, which is secured to trolley 8 and has a circumferential outer groove 35 (figure 6) engaged by relative end portion 18a, 18b, an end portion of which is connected integrally to trolley 8 and to the end portion of the other portion 18a, 18b by a common clamp 36. Alternatively, the two free end portions of portions 18a, 18b are joined to form an endless cable, and clamp 36 secures the join or intermediate portions of portions 18a, 18b directly to trolley 8.

[0021] In the Figure 5 variation, clamp 36 is replaced by a drum 38 fixed to trolley 8, between guide members 34, and about which the joined end portions 18a, 18b are wound and conveniently secured to drum 38 by one or more dead turns of the cable.

[0022] Devices 20 described, by connecting haul cable 18 firmly to trolley 8, regardless of whether haul cable 18 is open or endless, therefore provide, unlike the solution in Patent EP 0 692 418 B1, for totally transferring compensation or elimination of any difference in tension between the portions wound about return pulleys 15 from trolley 8 to the return pulleys and counterweights, thus greatly simplifying the design of the trolley.

[0023] Moreover, by enabling the use of open haul cables, system 1 described provides, unlike the known solution, for fast, easy takeup of any variation in the length of the haul cable caused by settling of the cable or normal operation of the system. In fact, in the case of the Figure 2 and 4 solutions, haul cable 18 is shortened by simply loosening and retightening clamps 31 and 36.

[0024] Alternatively, haul cable 18 is shorted, in the Figure 1 solution, by simply remaking joints 27, and, in the Figure 2 and 5 solutions, by simply winding it about one or both of drums 29 and about drum 38 respectively.

[0025] When using endless cables, as in the Figure 4 and 5 solutions, clamp 36 and drum 38 provide, when performing routine maintenance and, therefore, when the system is shut down, for sliding the cable easily with respect to trolley 8 and pulleys 14 and 15.

[0026] Unlike known solutions, the characteristics described - in particular, distancing from trolley 8 compensation of any difference in the tension of haul cable 18 on the return side - enable the use of both open cables, thus solving all the problems connected with splicing the haul cable, and endless cables, which may be joined using straightforward clamps and/or in such a manner that the join is located at the clamps or drums, with no need for special joints for forming constant-strength cables.

Claims

1. A cableway system with supporting and haul cables, comprising at least one pair of supporting cables located a given distance apart and secured at opposite ends, a trolley fitted to said supporting cables, and a haul-cable drive interposed between an actuating unit and said trolley to move the trolley in opposite directions along said supporting cables; the haul-cable drive comprising two drive pulleys connected to said actuating unit and located at a drive station, two return pulleys located at a return station, and a haul cable wound about the two drive pulleys and the two return pulleys; the haul-cable drive also comprising relative-mobility means interposed between said trolley and an intermediate portion of said haul cable extending between said drive pulleys, to permit relative movement of said intermediate portion with respect to said trolley; and the system being **characterized in that** said haul-cable drive also comprises retaining means carried by said trolley to fix firmly to the trolley the portions of said haul cable extending from said return pulleys towards said trolley.

2. A system as claimed in Claim 1, **characterized in**

that said haul cable is an open cable terminating at opposite ends with said portions extending from said return pulleys towards said trolley; said retaining means comprising first and second retaining means, each for connecting a respective end portion of said open haul cable firmly to said trolley.

3. A system as claimed in Claim 2, **characterized in that** said first and second retaining means are located on opposite lateral sides of said trolley.

4. A system as claimed in any one of the foregoing Claims, **characterized in that** said first and second retaining means comprise, respectively, a first and second drum fitted to the trolley, and about which is wound an intermediate portion of a relative portion extending from the relative said return pulley towards said trolley.

5. A system as claimed in Claim 4, **characterized in that** said first and second retaining means comprise, for each said drum, a respective retaining clamp for firmly connecting an end of the respective portion extending from said return pulley and projecting from the relative said drum.

6. A system as claimed in any one of Claims 2 to 5, **characterized in that** said first and second retaining means comprise respective guide members fixed to said trolley; and a single common clamp interposed between said guide members to secure firmly to said trolley said end portions of said haul cable.

7. A system as claimed in Claim 1, **characterized in that** said haul cable is an endless cable, and said retaining means comprise, for each return pulley, a respective curved guide fixed to the trolley, and a retaining member interposed between the curved guides to connect firmly to said trolley a continuous portion of said haul cable extending between said curved guides.

8. A system as claimed in Claim 7, **characterized in that** said retaining member comprises a clamp through which said continuous portion extends.

9. A system as claimed in Claim 7, **characterized in that** said retaining member comprises a drum, about which is wound and secured an intermediate portion of said continuous portion.

10. A system as claimed in Claim 9, **characterized in that** said intermediate portion of said continuous portion is secured to said drum by at least one dead turn of said intermediate portion.

11. A system as claimed in any one of the foregoing Claims, **characterized in that** said haul-cable drive comprises at least one sense pulley fitted to said trolley and located between said idle pulleys to detect any variation in the tension of the haul cable.

12. A system as claimed in any one of the foregoing Claims, **characterized in that** said relative-mobility means comprise a number of parallel, side by side rollers, on which is located the portion of haul cable extending between said drive pulleys.

13. A system as claimed in any one of Claims 1 to 11, **characterized in that** said relative-mobility means comprise two curved slide and guide surfaces, on which part of said haul cable slides.

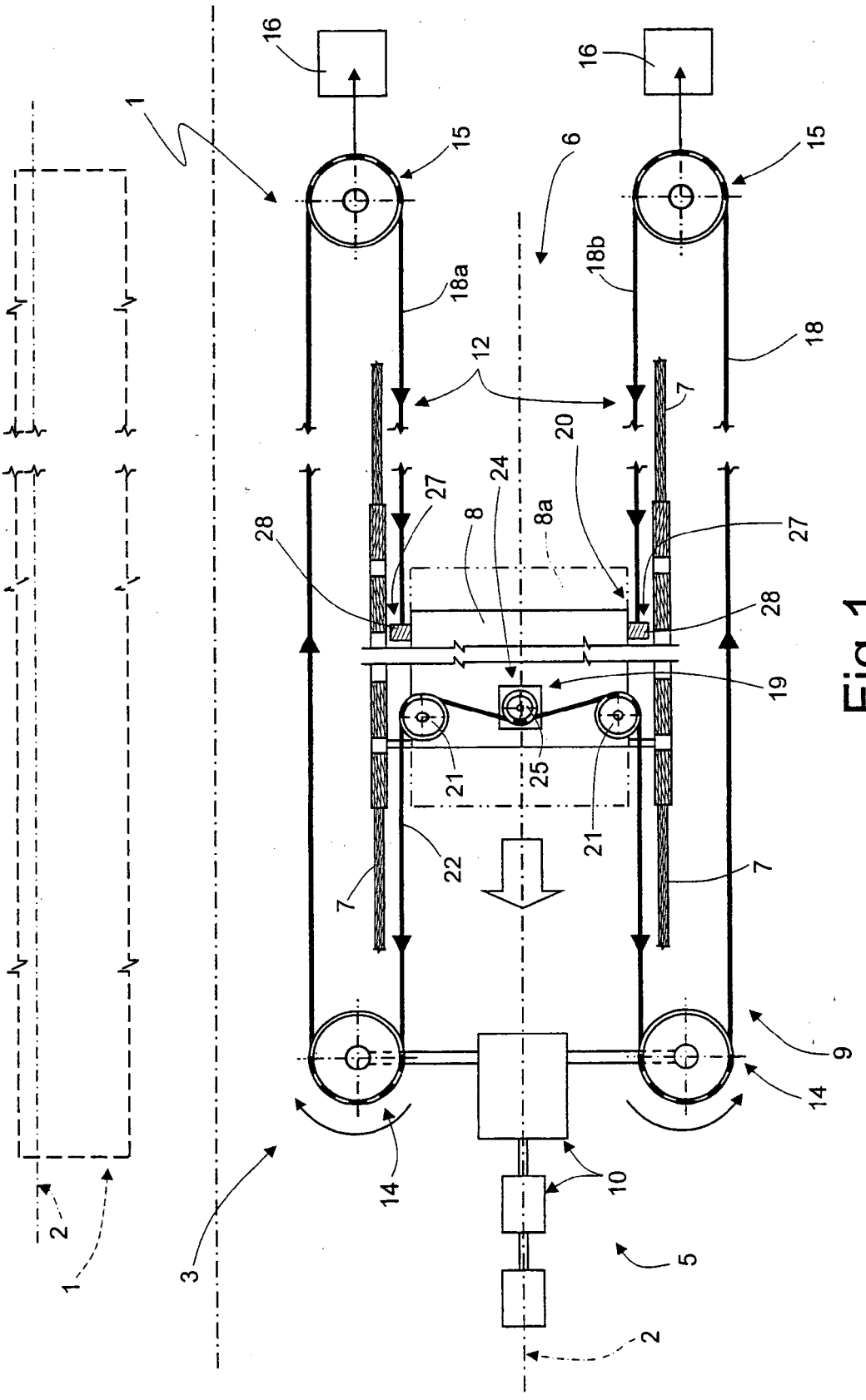


Fig.1

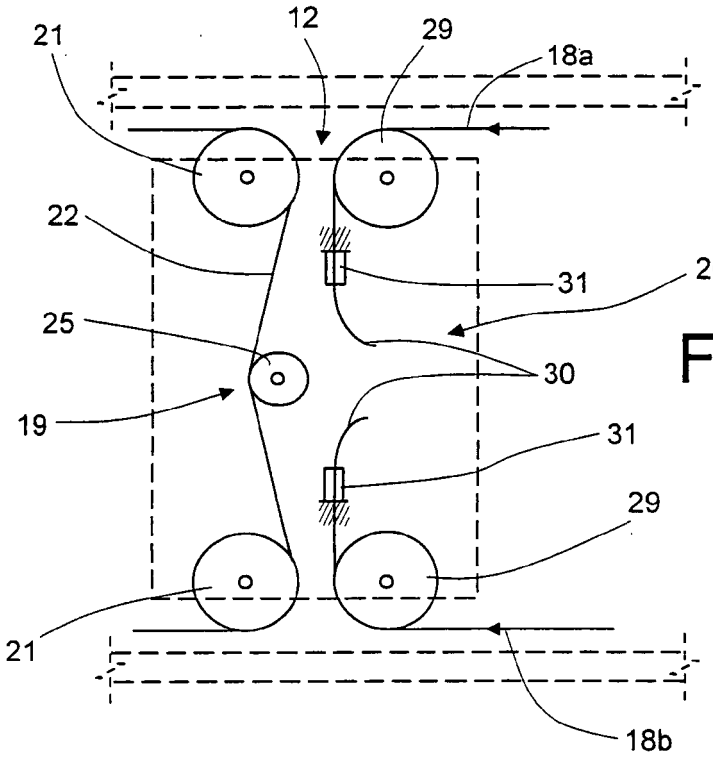


Fig.2

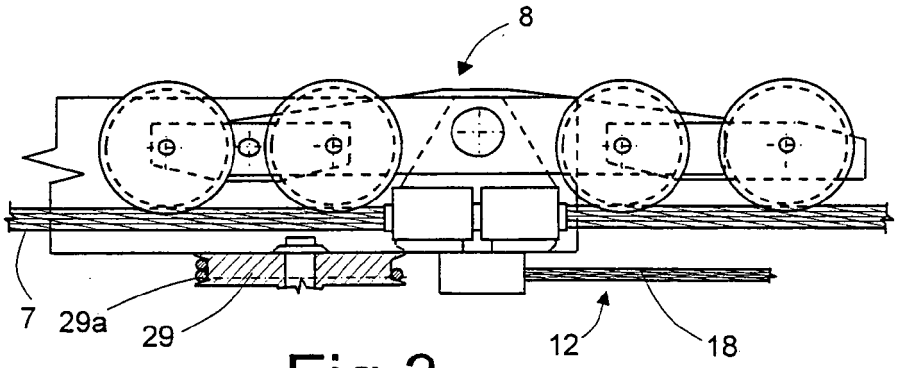


Fig.3

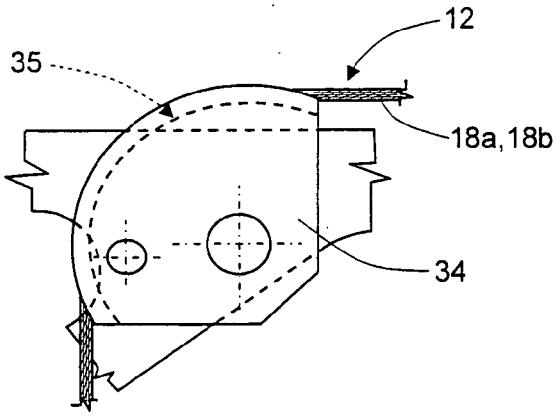


Fig.6

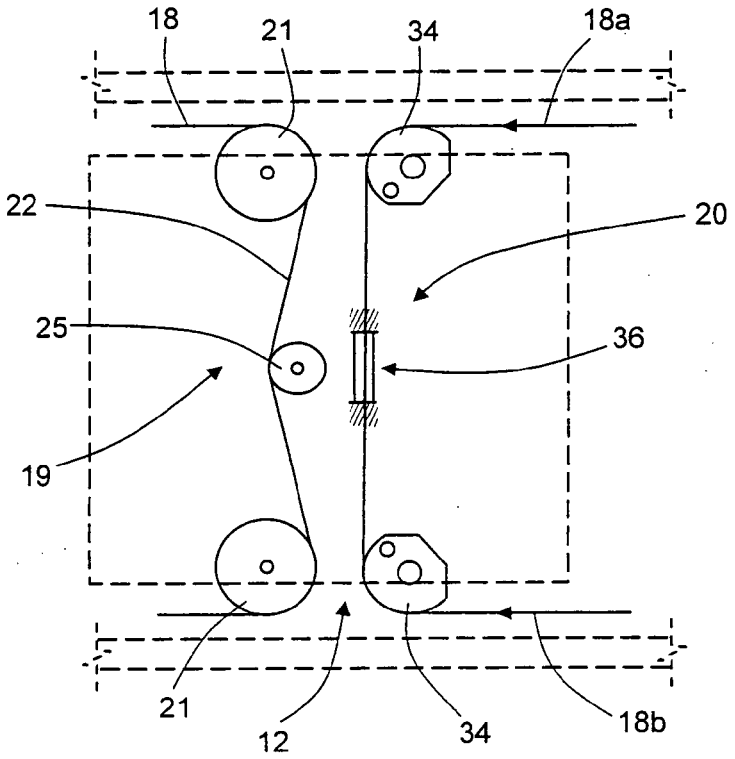

18
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34
18a
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36
19
21
12
34
18b

Fig.4

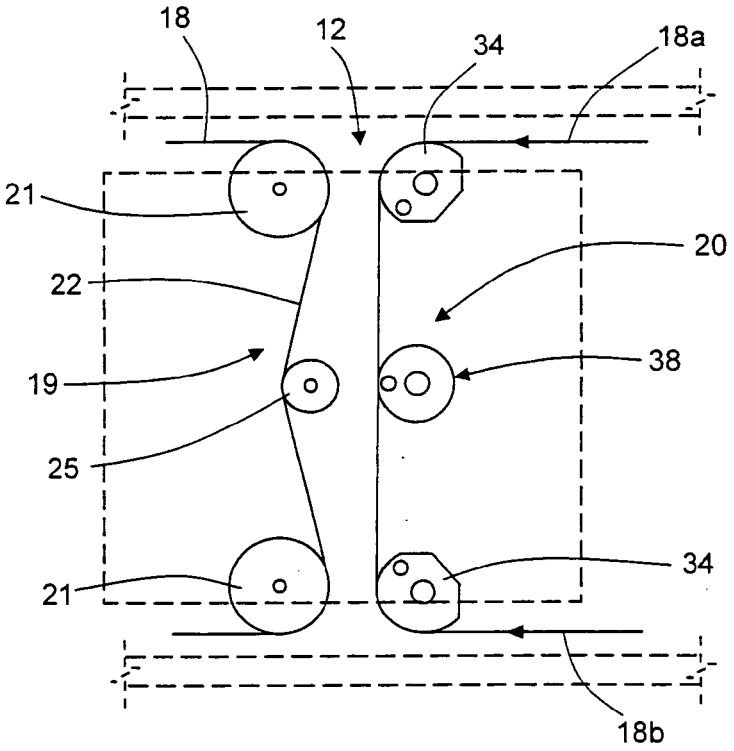

18
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18a
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22
19
38
25
21
34
18b

Fig.5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 42 5837

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TECHNICAL FIELDS SEARCHED (IPC)

B61B
B66B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 June 2008	Ferranti, Max

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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