



(51) International Patent Classification:

B62D 1/185 (2006.01) **F16D 3/06** (2006.01)
B62D 33/067 (2006.01)

(21) International Application Number:

PCT/SE2010/000267

(22) International Filing Date:

3 November 2010 (03.11.2010)

(25) Filing Language:

English

(26) Publication Language:

English

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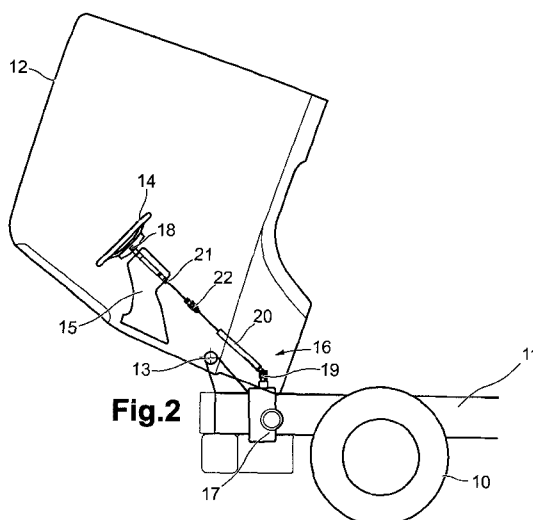
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

(54) Title: TELESCOPIC VEHICLE STEERING COLUMN



(57) Abstract: A steering column (16) for rotationally connecting together a steering wheel (14) and a steering gear box (17) of a cab-over engine type vehicle which has a tillable cab (12) for exposing the engine for maintenance. The steering column (16) has a first end (18) connectable to the steering wheel (14) and a second end (19) connectable to the steering gear box (17). The steering column comprises a lower steering column shaft (20) adapted to be connected at one end via the second end (19) to said steering gear box (17), and at the other end to an upper steering wheel column shaft (21). The lower column shaft (20) is telescopic and the upper steering column shaft (21) is rotatable suspended inside the cab (12). The steering wheel column shaft (21) is telescopic, thereby permitting the distance between the steering wheel (14) and the upper end of the lower steering column shaft (20) to vary in length.

TELESCOPIC VEHICLE STEERING COLUMN

TECHNICAL FIELD

The present invention relates to extensible steering shafts for rotationally connecting
5 together a steering wheel and a steering gear box of a cab-over type vehicle which has a tiltable cab for exposing an engine for maintenance.

BACKGROUND OF THE INVENTION

As is known, some vehicles of the heavy truck type are provided with a driver's cab which
10 is tiltable relative to the chassis in order to facilitate servicing, particularly of the engine.

In most cases, the hinge axis of the cab does not coincide with the hinge axis of one of the universal joints of the hinged steering column. The tilting of a cab therefore entails axial lengthening or shortening of the steering column and thus makes it necessary to use an extensible or telescopic coupling in the steering column.

15 This type of coupling is also used for the steering columns of vehicles equipped with systems for the adjustment, particularly the axial adjustment, of the position of the steering wheel, and also when the cab is mounted on the chassis with the aid of a suspension system. This implies the possibility of modifying the axial length of at least a part of the steering column. In the first case, the driver may adapt the position of the
20 steering wheel in the cab, so as to ensure agreeable and comfortable driving. In the second case, while the vehicle is moving and the driver is in his driving station, the cab is displaced relative to the chassis and the steering wheel following the deflections of the cab relative to the chassis and is thus subjected to oscillations which are random in respect of both frequency and amplitude, and which modify the axial length of the steering
25 column in accordance with the fluctuations of road conditions; these deflections are practically continuous while the vehicle is moving.

In certain cab applications, when the distance between the steering wheel and the steering gear box is relatively short, for example when a vehicle steering system
30 comprises a steering gear box provided with active torque overlay steering control, it is a

problem to provide enough telescopic movements in the steering column to allow the cab to tilt to a position where servicing can be performed without some difficulty. It is possible to provide steering shafts with a plurality of coaxial shafts to enable increased telescopic movement. However, this solution is expensive, adds weight and is less resistant to wear.

5

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a steering wheel arrangement which provides more telescopic movement without the above described problems.

In accordance with the present invention, this object is achieved by a steering column for
10 rotationally connecting together a steering wheel and a steering gear box of a cab-over engine type vehicle which has a tiltable cab for exposing the engine for maintenance. The steering column has a first end connectable to the steering wheel and a second end connectable to the vehicle steering gear box. The steering column comprises a lower steering column shaft adapted to be connected at one end via said second end to said
15 steering gear box, and at the other end to be connected to an upper steering wheel column shaft. The lower column shaft is telescopic and the upper steering column shaft is rotatable suspended inside the cab. The steering wheel column shaft is telescopic, thereby permitting the distance between the steering wheel and the upper end of the lower steering column shaft to vary in length. Due to the fact that the steering column
20 shaft is telescopic, permitting the distance between the steering wheel and the lower steering column shaft to vary in length, the problem of increasing telescopic movement when tilting a cab is solved in a simple and efficient manner.

According to one advantageous embodiment of the invention, the steering wheel column
25 shaft comprises first and second coaxial shafts non-rotationally coupled by splines allowing telescopic movement during tilting of the cab.

According to another embodiment of the invention, the splines coupling is provided with a coating adapted to control the friction between the first and the second shaft. In this
30 manner, telescopic movement in the steering column is controlled so that the lower steering column shaft always moves before any telescopic movement occurs in the steering wheel column shaft.

Preferably, the friction in the steering wheel column shaft coupling is controlled in relation to the internal friction of the lower steering column shaft, so that friction is higher in the steering wheel column shaft than in the lower steering column shaft.

- 5 The lower steering column shaft is preferably provided with a locking mechanism which is adapted to position the lower steering column shaft in an extended position. Preferably the locking mechanism is adapted to position the lower steering column shaft in the extended position during cab tilting, until the cab is returned downwards sufficiently to allow the steering wheel column shaft to return to a retracted position, wherein the locking
10 mechanism is released. The locking mechanism may be a releasable clip ring spring.

The problem of controlling telescopic movements in the steering column during cab tilting operation is solved by the friction coating in combination with the releasable locking mechanism.

15

The steering gear box is preferably provided with active torque overlay steering control.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention will be described in greater detail below with reference to
20 accompanying drawings, in which:

Figures 1 and 2 are schematic views of the front part of a cab over engine truck showing the cab in operative position and tilted position respectively, and illustrating telescopic movement in a steering column according to the invention, and
Figure 3 shows the steering column in larger scale.

25

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The cab over engine truck of figure 1 is shown with a front wheel 10, a chassis frame 11 and a cab 12. The cab 12 is connected to the chassis frame 11 via a pivot point 13. The cab is also connected to the frame via a suspension system (not shown in the drawings
30 but well known in the field), allowing the cab 12 to move vertically for driver comfort.

A steering wheel 14 is rotatable mounted via a console 15 in the cab 12. Steering input is transmitted via a steering column 16 to a steering gear box 17 attached to the chassis

frame 11. The steering column 16 has a first end 18 connected to the steering wheel 14 and a second end 19 connected to the steering gear box 17.

The steering column comprises a lower steering column shaft 20 and an upper steering wheel column shaft 21. The lower steering column shaft 20 is connected at one end via the above mentioned second end 19 to the steering gear box 17. The other end of the lower steering column shaft 20 is connected to the lower end of the steering wheel column shaft 21.

The lower steering column shaft 20 is telescopic, allowing substantially frictionless movement in a first interval, to provide movement in the steering column for movements in the cab suspension system. The lower steering column shaft 20 is also telescopic to allow movement in a second interval, to provide movement in the lower steering column shaft for tilting the cab to a service position shown in figure 2, allowing access to the engine for maintenance.

The upper steering column shaft 21 is connected via a coupling 22 to the upper end of the lower steering column shaft 20 and the steering wheel 14 is attached to the upper end of the upper steering column shaft 21. In order to increase telescopic movement in the steering column during cab tilting, also the upper steering column shaft 21 is telescopic, thereby permitting the distance between the steering wheel 14 and the lower steering column shaft 20 to vary in length.

Figure 3 shows the steering column in more detail with the lower end of the lower steering shaft 20 provided with a universal joint 23 for pivotal connection to the steering gear box. The frictionless interval of movement is illustrated at 24 with an axial ball bearing. At the opposite end, the lower steering shaft 20 is provided with a locking mechanism 25 which is adapted to position the frictionless interval 24 of the lower steering shaft in an extended position, and a second universal joint 22 forming the coupling connecting the lower steering shaft 20 to the upper steering wheel column shaft 21. Both the lower steering column shaft 20 and the upper steering column shaft 21 comprise first and second coaxial shafts non-rotationally coupled by splines to allow for telescopic movement, in accordance with common practice. The splines coupling in the upper steering column shaft is provided with a coating adapted to control the friction between the first and the second shaft, so

that the friction is higher in the steering wheel column 21 shaft than in the lower steering column shaft 20.

The locking mechanism 25 comprises a clip ring spring which is adapted to position the frictionless interval 24 of the lower steering shaft 20 in the extended position during cab tilting, until the cab is returned downwards sufficiently to allow the second movement interval of the lower steering column shaft 20 and the steering wheel column shaft 21 to return to a retracted position, wherein the locking mechanism 25 is released.

10 Cab tilting can be performed in the following manner:

- safety catches securing the cab to the frame are released,
- hydraulic pressure is applied for cab tilting,
- due to the higher friction in the second movement interval of the lower steering column shaft 20 and the upper steering wheel column shaft 21, the lower steering column shaft 20 will extend the frictionless interval 24 of movement to its maximum in which position the clip ring spring 25 will be functionally activated,
- further cab tilting to full service angle extends the lower steering column shaft 20 and the steering wheel column shaft 21 until the centre of gravity of the cab has passed the pivot point 13,
- when returning cab tilt back to normal, the clip ring spring 25 will retain the frictionless interval 24 of movement in the lower column shaft 20 fully extended until the second movement interval of the lower steering column shaft 20 and the upper steering column shaft 21 is fully retracted,
- now the clip ring spring 25 is released by the weight of the cab allowing the frictionless interval 24 of the lower column shaft to retract until the cab is secured to the frame again by the safety catches.

Thus, telescopic movement in the steering column is controlled during cab tilting, so that at first the frictionless movement interval of the lower column shaft 20 is fully extended, and then the remaining interval of the lower column shaft 20 and the upper steering wheel column shaft 21 are extended. When the cab is reversed to its normal position, telescopic movement in the steering column is controlled so that at first the upper steering wheel column shaft 21 and the second movement interval of the lower steering column shaft 20 are fully retracted and then, the frictionless movement interval of the lower column shaft 20 is retracted.

The invention is not to be limited to the embodiments indicated above, but can be varied freely within the scope of the accompanying claims. For example, other means than a clip ring spring may be used for the locking mechanism 25. Also, the lower column shaft may
5 be provided with telescopic mobility in more steps than described.

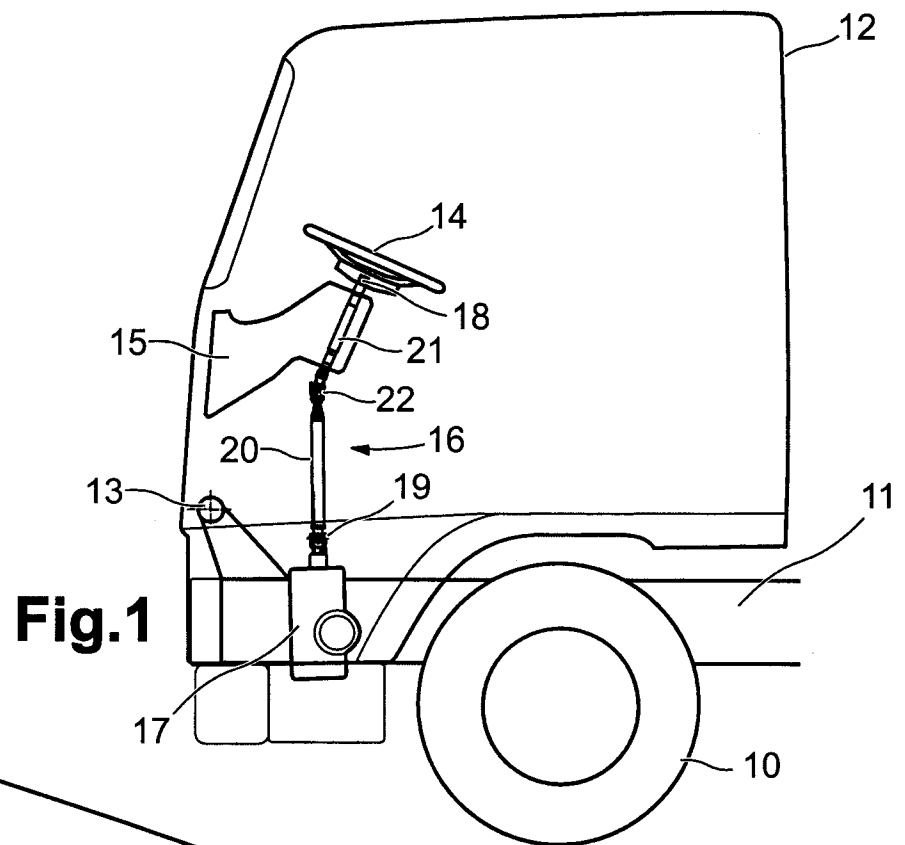
CLAIMS

1. Steering column (16) for rotationally connecting together a steering wheel (14) and a steering gear box (17) of a cab-over engine type vehicle which has a tiltable cab (12) for exposing the engine for maintenance, said steering column (16) having a
5 first end (18) connectable to the steering wheel (14) and a second end (19) connectable to the steering gear box (17) and comprising a lower steering column shaft (20) adapted to be connected at one end via said second end (19) to said steering gear box (17), and at the other end to be connected to an upper steering wheel column shaft (21), wherein the lower column shaft (20) is telescopic and the
10 upper steering column shaft (21) is rotatable suspended inside the cab (12), characterized in that the steering wheel column shaft (21) is telescopic, thereby permitting the distance between the steering wheel (14) and the upper end of the lower steering column shaft (20) to vary in length.
2. Steering column according to claim 1, characterized in that the steering wheel
15 column shaft (21) comprises first and second coaxial shafts non-rotationally coupled by splines allowing telescopic movement during tilting of the cab (12).
3. Steering column according to claim 2, characterized in that the splines coupling is
20 provided with a coating adapted to control the friction between the first and the second shaft.
4. Steering column according to claim 3, characterized in that the friction in the
25 splines coupling is controlled in relation to the internal friction of the lower steering column shaft (20), so that friction is higher in the steering wheel column shaft (21) than in the lower steering column shaft (20).
5. Steering column according to claim 4, characterized in that the lower steering
30 column shaft (20) is provided with a locking mechanism (25) which is adapted to position the lower steering column shaft in an extended position.
6. Steering column according to claim 5, characterized in that the locking mechanism (25) is adapted to position the lower steering column shaft (20) in the extended position during cab tilting, until the cab is returned downwards sufficiently to allow

the steering wheel column shaft (21) to return to a retracted position, wherein the locking mechanism is released.

- 5 7. Steering column according to claim 5 or 6, characterized in that the locking mechanism (25) is a releasable clip ring spring .
8. Steering column according to any one of claims 1-7, characterized in that the steering gear box (17) is provided with active torque overlay steering control.
- 10 9. A vehicle comprising a steering column according to any one of claims 1-8.

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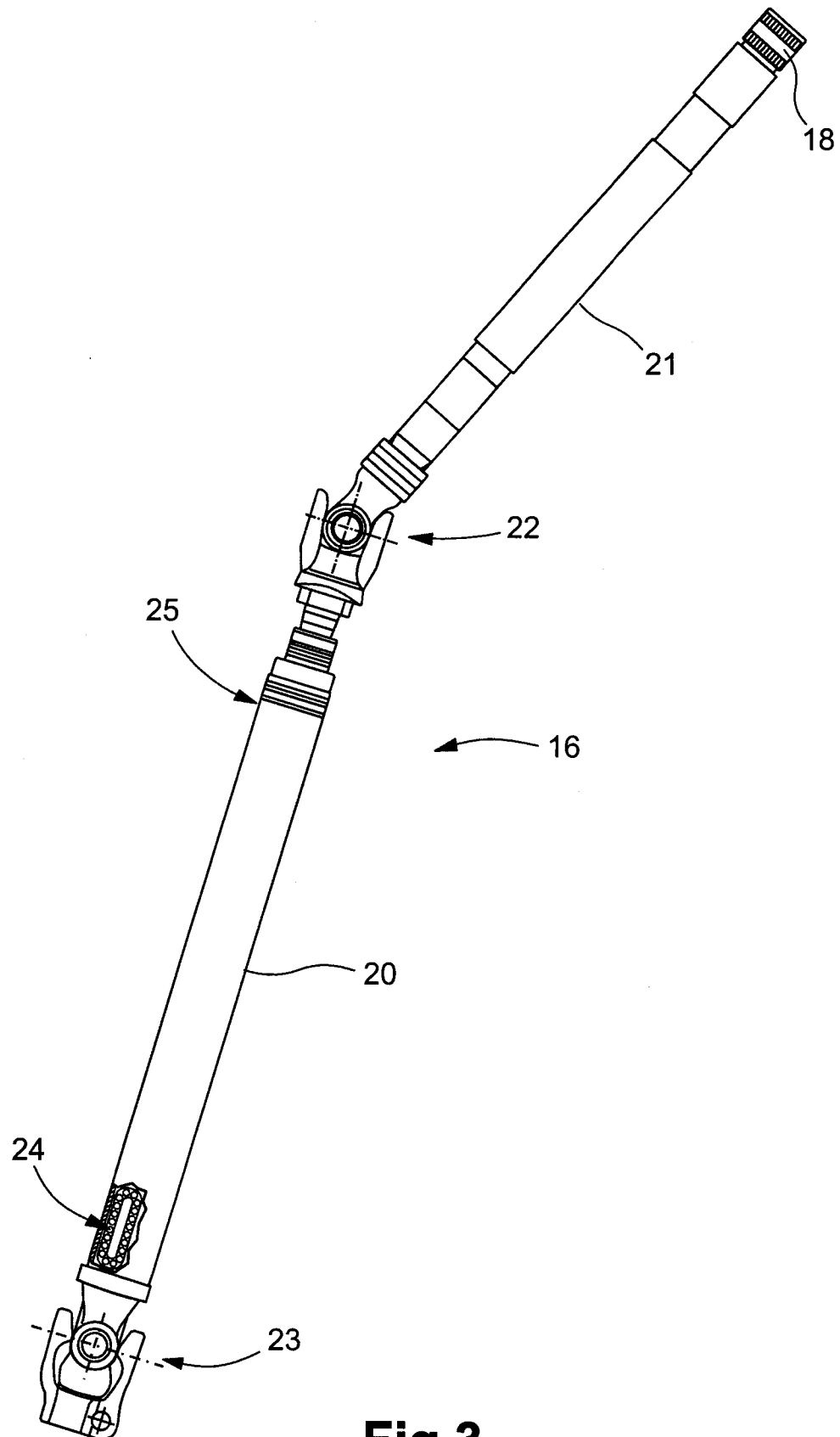


Fig.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2010/000267

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B60G, B62D, F16D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, COMPENDEX, SAE.org

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007042859 A1 (RENAULT TRUCKS ET AL), 19 April 2007 (2007-04-19); abstract; page 7, line 7 - line 31; figure 2	1-3, 8, 9
A	--	4-7
X	DE 2917660 A1 (ROBUR WERKE ZITTAU VEB), 7 February 1980 (1980-02-07); figure 1; page 1, section 1; page 5, section 2 - page 6	1, 9
A	--	2-8



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Date of the actual completion of the international search

07-06-2011

Date of mailing of the international search report

27-06-2011

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2010/000267

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2008044402 A (NSK LTD), 28 February 2008 (2008-02-28); (abstract) Retrieved from: PAJ database; Original document: Figure 1,3,4 --	2-9
A	EP 1693579 A2 (NSK LTD), 23 August 2006 (2006-08-23); abstract; paragraphs [0002]-[0003], [0048]; figures 1A, 1B --	1-9
A	GB 1575566 A (FORD MOTOR CO), 24 September 1980 (1980-09-24); page 2, line 20 - line 32; figure 1 --	1-9
A	AT 296781 B (STEYR DAIMLER PUCH AG), 25 February 1972 (1972-02-25); page 1, line 1 - line 26; figure 1 --	1-9
A	US 2937881 A (NORRIE ROBERT C), 24 May 1960 (1960-05- 24); column 1, line 28 - line 33; column 2, line 17 - line 23; figure 1 -- -----	1-9

Continuation of: second sheet

International Patent Classification (IPC)

B62D 1/185 (2006.01)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2010/000267

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