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(54) LOAD LOCKING SYSTEM, ESPECIALLY ON FREIGHT WAGONS

(57) The system consists of a set of sliding locking arms (1) mounted on guide tubes (2) and screws(3) parallel to the guide tubes (2) cooperating with nuts (7), each screw (3) being equipped with a motor (4) electrically connected to its end (3') by means of a claw coupling (5); electronic control system with ultrasonic sensors (9) and an independent power supply system.

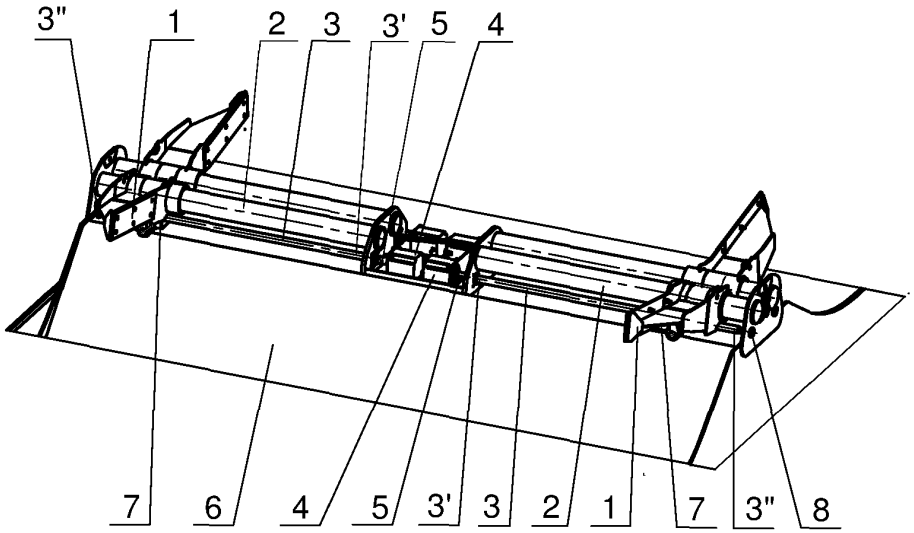

Fig. 3

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Description

[0001] The subject of the invention is a system for locking loads, especially on railway wagons, intended in particular for locking coil-shaped loads.

[0002] Technical solutions known to be in use for locking devices in the direction transverse to the direction of travel of the load, such as, for example, metal coils or concrete coils on railway wagons, have locking arms that can move and rotate along the guide pipe. The arms are usually moved and locked manually, requiring the person to climb the wagons loading area. There are also known solutions that allow the arms to be moved and locked from the track level. Each locking arm is moved and locked individually. For this reason, load securing must be carried out by two persons, or one person must operate the wagon from both sides.

[0003] The Polish patent PL222981 (B1) describes a load locking device on freight wagons, having a pressure arm mounted in a rotational and movable way on a guide pipe, to which a propeller with a shaped tip and a spin wheel mounted on it are placed in parallel. On the propeller, in the cutout of the pressure arm, there is a threaded part of the driver in the form of a half-nut with a control cam. In the lower part of the driver there is a cutout in the shape of an inverted U letter, the arch of which is threaded and located between the arms blocking its rotation on the guide. The upper part of the driver is formed into a hook placed on the control cam provided with the control cam lever.

[0004] From the Slovak description of the utility model No. 6092, there is known a mechanism securing a cylindrical load, the essential parts of which are stanchions, guide pipes, nuts with drivers cooperating with rotating threaded spindles that move clutches, chains and sprockets mounted on the shaft.

[0005] The essence of the invention consists in the fact that the load blocking system, especially on freight wagons equipped with troughs, consists of:

- a set of sliding locking arms mounted on the guide tubes and propellers parallel to the guide tubes cooperating with the nuts, each propeller being equipped with an electric motor connected to its end by means of a dog clutch,
- electronic control system with ultrasonic sensors,
- independent power supply system.

[0006] In a preferred embodiment, the electric motors are stepper motors.

[0007] Preferably, the electric motors are integrated with a common independent power supply system.

[0008] Preferably, the electric motors assigned to a single trough are connected to a local control unit coupled to at least one ultrasonic sensor for each trough that detects the load in the trough. Preferably, the ultrasonic sensor is located in the middle of the wagon trough. Advantageously, the electronic control system, in addition to ultrasonic sensors, consists of local control units, control panels and a central control unit responsible for sequential advancing and retracting the locking arms in successive troughs.

[0009] Preferably, the independent power supply system consists of a generator, a battery and a charge controller.

[0010] Most preferably, the generator is mounted in the axle box of the wagon wheelset.

[0011] In a preferred embodiment, the propellers and the cooperating nuts mechanically connected to the locking arms are equipped with a self-locking thread.

[0012] Preferably, the opposite end of the propeller is equipped with a shaped tip for connecting the emergency drive.

[0013] The main advantage of the device according to the invention is the stepless system of moving the locking arms together with the electronic control system, which makes it possible to block the load placed anywhere in the trough.

[0014] The device enables automatic moving of the locking arms to contact with the load or to a predetermined distance from the load specified by the device operator. Ultrasonic sensors assigned to each trough detect the load and ensure maintenance-free operation of the system. The control desks used by the staff to control the operation of the device can be mounted anywhere in the car, preferably at the ends of the car on both sides. The locking device can also be operated remotely via the Bluetooth wireless standard. The device is powered from an independent power supply system.

[0015] The subject of the invention is illustrated by the embodiment shown in the drawing, in which Fig. 1 shows a view of a freight car with devices blocking the movement of sheet metal coils in the transverse direction of the wagon, Fig. 2 - view of the device blocking the movement of sheet metal coils, Fig. 3 - blocking device load, Fig. 3 - screw drive mechanism and Fig. 5 - block diagram of the control system.

[0016] The load blocking system on freight wagons with at least one trough is equipped with blocking arms 1, which limit the lateral movement of the load in the form of coils. As a standard, four locking arms 1 are used for one trough. The locking arms 1 are mounted movably on the guide pipes 2 located parallel to the trough 6 on the upper edge of the trough 6 or between the neighboring troughs 6. Parallel to the guide pipes 2, there are drive screws 3 with which the nuts 7 work together. The nuts 7 are mechanically connected to the locking arms 1. The inner end 3' of each propeller 3 is connected by a claw coupling 5 with the electric motor 4. The electric motors 4 rotate the propellers 3, which causes the nuts to move along the propellers 3 and moving the locking arms 1 towards or away from the load. The propeller 3 and nuts 7 have a self-locking thread, therefore the locking arms 1 cannot move on their own and, when pushed close to the load, they protect it against transverse movement.

[0017] The electric motors 4 are controlled by an elec-

tronic control system, which consists of ultrasonic sensors (9), local control units (10), a central control unit (11) and control panels (12) preferably located at the ends of the car on both sides on the walls side boxes.

[0018] Electric motors 4 assigned to a single trough 6 are controlled by a local control unit 10 coupled with at least one ultrasonic sensor 9 for each trough, which detects the load in the trough 6. The central control unit 11 is responsible for the sequential process of moving the locking arms 1 in the troughs, protecting the electrical power system against excessive overload. The sequential process of moving the locking arms 1 in or out consists in the fact that the arms are not moved in or out simultaneously in all troughs, but one at a time in each trough 6.

[0019] The electric motors 4 and the electronic control system are supplied with electricity from the electric battery 13 mounted on the car, which is charged by the generator 14 mounted in the axle box of the wheelset and the charging regulator 15. Ultrasonic sensors 9 placed in the center of each trough 6 detect the load in the trough 6 and allow the locking arms 1 to be automatically moved to contact with the load or to a predetermined distance from the load specified by the device operator. The locking device can be operated via the panels 12 or remotely via the Bluetooth wireless standard.

[0020] The opposite 3" end of the propeller 3, led outside the device, has a shaped tip 8, on which a crank, a handwheel or a portable electric device can be placed, which in the event of failure of the electric drive can move the locking arms 1 in an emergency.

Claims

1. A load locking system, especially on freight wagons equipped with troughs (6), **characterized in that** it consists of:

   - a set of sliding locking arms (1) mounted on guide pipes (2) and parallel to the guide pipes (2) of the drive screws (3) cooperating with the nuts (7), each screw (3) being equipped with a motor (4) electric connected to its end (3') by means of a claw coupling (5),
   - electronic control system with ultrasonic sensors (9),
   - independent power supply system.

2. A system according to claim 1, **characterized in that** the electric motors (4) are stepper motors.

3. A system according to claim 1 or 2, **characterized in that** the electric motors (4) are integrated with a common independent power supply system.

4. A system according to claim 1 or 2 or 3, **characterized in that** the electric motors (4) assigned to a single trough (6) are connected to a local control unit (10) coupled with at least one ultrasonic sensor (9) for each trough (6) detecting the load in troughs (6).

5. A system according to claim 4, **characterized in that** the ultrasonic sensor is located in the central part of the trough (6) of the wagon.

6. A system according to claim 1 or 2 or 3 or 4, **characterized in that** the electronic control system, apart from ultrasonic sensors (9), consists of local control units (10), control panels (12) and a central control unit (11) responsible for sequential advancing and retracting the arms (1) blockers in successive moguls (6).

7. A system according to claim 1 or 2 or 3 or 4 or 6, **characterized in that** the independent power supply system consists of a generator (14), a battery (13) and a charge regulator (15).

8. A system according to claim 1 or 7, **characterized in that** the generator (14) is mounted in the axle box of the wagon wheelset.

9. A system according to claim 1, **characterized in that** the drive screws (3) and the nuts (7) cooperating with them, mechanically connected to the locking arms (1), are equipped with a self-locking thread.

10. A system according to claim 1, **characterized in that** the opposite end (3") of the propeller (3) is equipped with a shaped tip (8) for connecting the emergency drive.

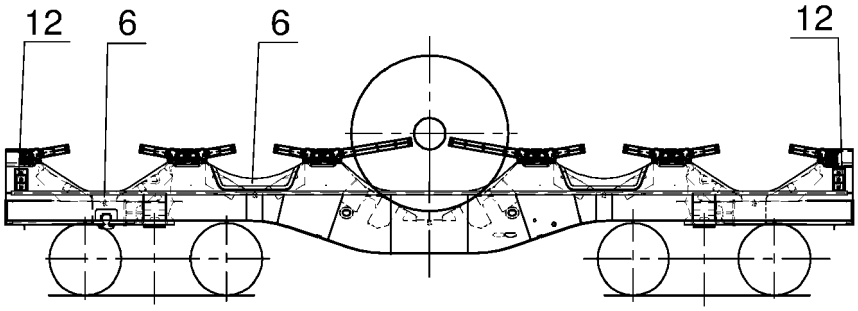

Fig. 1

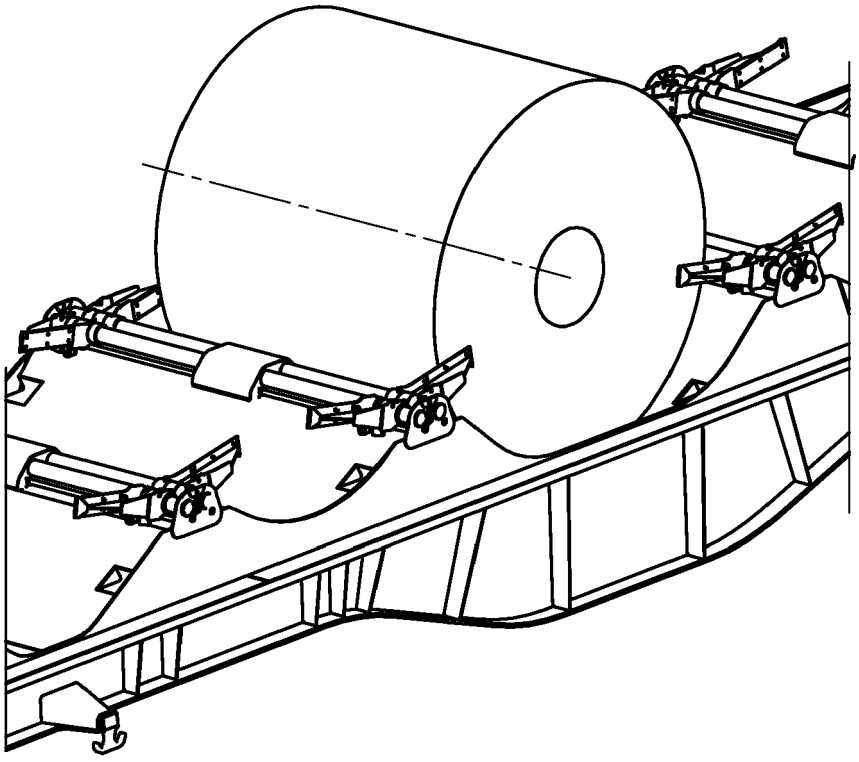

Fig. 2

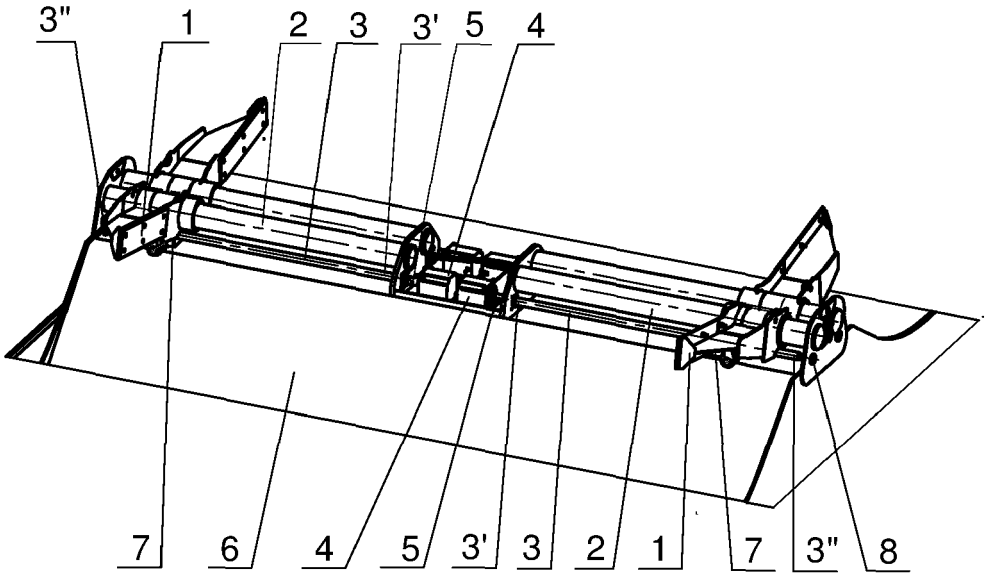

Fig. 3

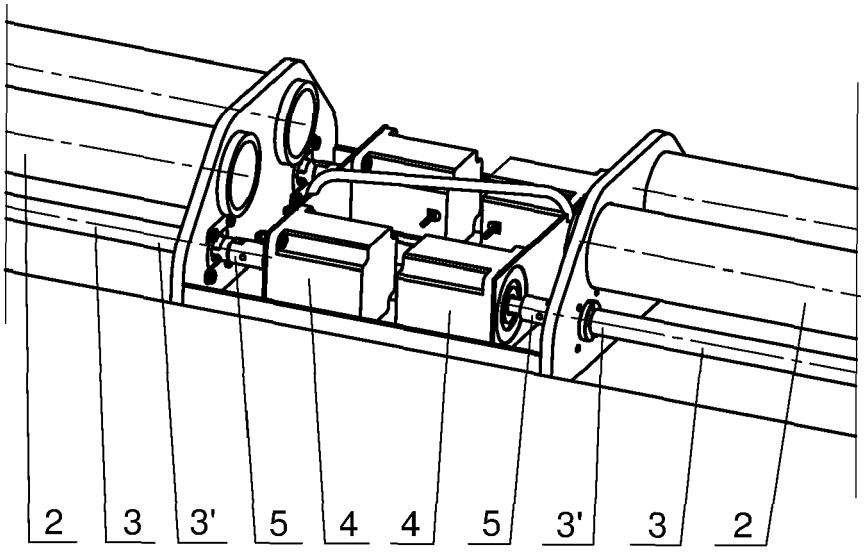

Fig. 4

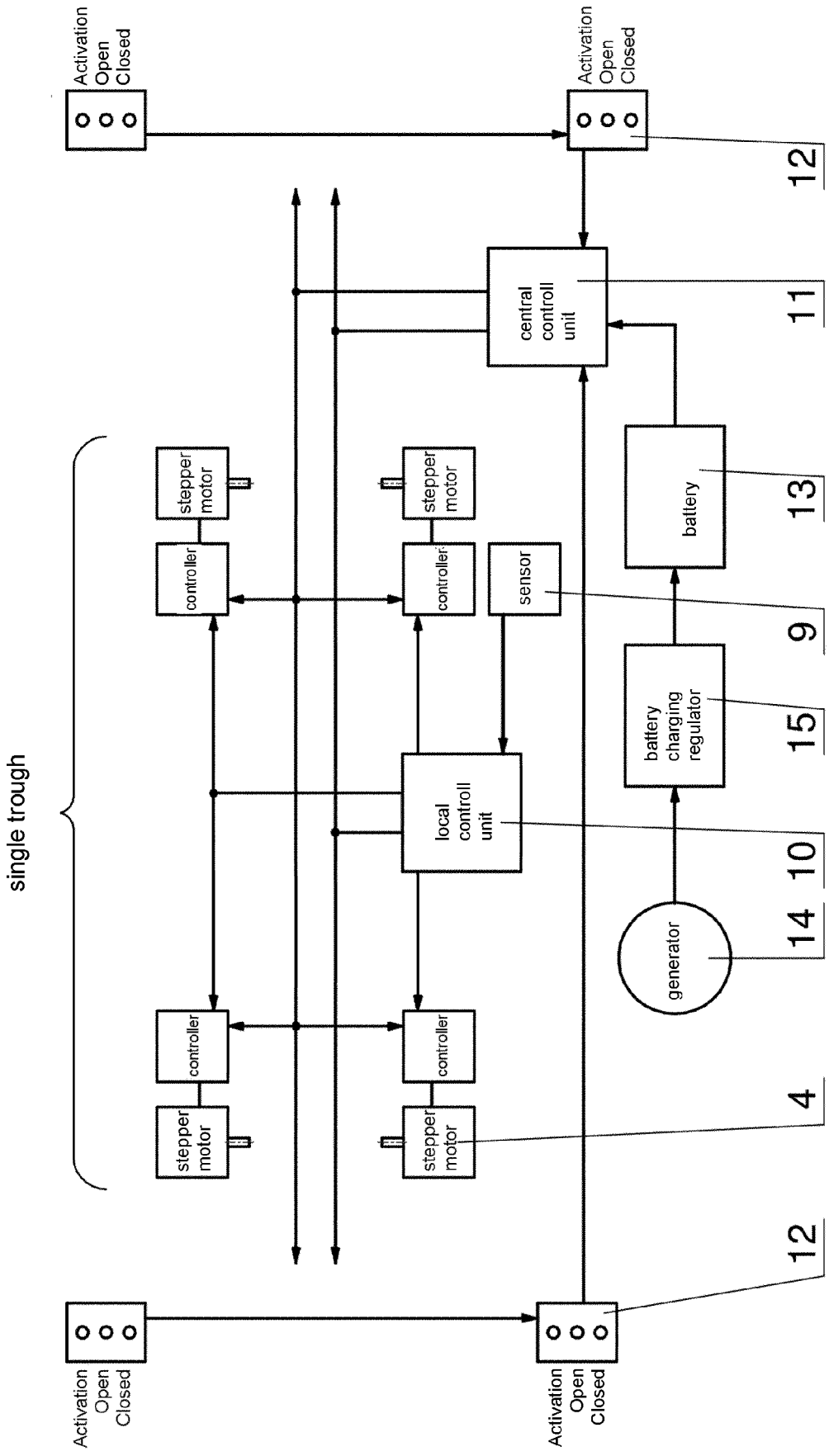
Activation
Open
Closed
Activation
Open
Closed
12
central controll unit
11
battery
13
sensor
9
battery charging regulator
15
local controll unit
10
generator
14
stepper motor
controller
stepper motor
controller
stepper motor
controller
stepper motor
controller
4
12
Activation
Open
Closed
Activation
Open
Closed
single trough

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 22 18 7355

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 20 2015 005518 U1 (BREMER KARL FRIEDRICH [DE]) 8 January 2016 (2016-01-08) * paragraph [0008] * * figures *	1-10	INV. B61D45/00
A,D	PL 222 981 B1 (WAGONY SWIDNICA SPÓLKA AKCYJNA [PL]) 30 September 2016 (2016-09-30) * the whole document *	1-10	
A	EP 0 712 771 B1 (SNCF [FR]; FRANCE WAGONS [FR]) 16 June 1999 (1999-06-16) * paragraph [0001] * * paragraphs [0021] - [0032] * * figures *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)

B61D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 April 2023	Durrenberger, Xavier

CATEGORY OF CITED DOCUMENTS

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27-04-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 202015005518 U1	08-01-2016	NONE	
PL 222981 B1	30-09-2016	NONE	
EP 0712771 B1	16-06-1999	DE 69510304 T2	17-02-2000
		EP 0712771 A1	22-05-1996
		ES 2135021 T3	16-10-1999
		FR 2726800 A1	15-05-1996

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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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Patent documents cited in the description

- PL 222981 B1 **[0003]**
- SK 6092 **[0004]**