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(54) **HOIST MECHANISM**

(57) The hoist mechanism comprises a hoist axle (10), at least one electric motor (16) for rotating the hoist axle, the electric motor having an axle, and an emergency use system for rotating the said electric motor axle. The emergency use system has been planned to be used when the supply of electric power to the electric motor has been interrupted, for example, because of a power cut or failure in the electrical system. The emergency use system includes a hydraulic motor (22), which is connected to the axle of the electric motor with the clutch (20). When the emergency use system is taken into use, the hydraulic motor is connected to the axle of the electric motor, after which the axle of the electric motor can be rotated by means of the hydraulic motor.

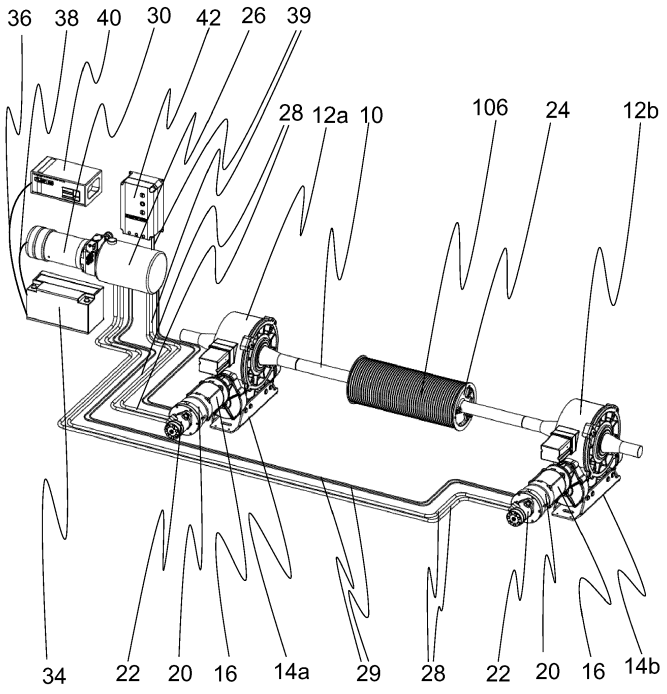

Fig. 1

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Description

[0001] The invention relates to a hoist mechanism, which comprises a hoist axle, at least one electric motor for rotating the hoist axle, the electric motor having an axle, and an emergency use system for rotating the axle of said electric motor.

[0002] Electrically driven hoist mechanisms are generally used in the overhead doors of buildings and halls. The hoist mechanism includes an axle rotated with one or several electric motors, coils for lifting wires or straps being attached to the axle. By rotating the axle the lifting wires or straps wind onto coils causing the overhead door to rise upwards. In connection with a power cut or failure of the electric system the electric motor belonging to the hoist mechanism does not work. For these kinds of situations the hoist mechanism is provided with a manually operated emergency use system functioning without electric power.

[0003] Several problems are related to the operation and use of manual emergency use systems. Overhead doors, especially fabric folding doors used in large hall buildings can be several meters high and even tens of meters wide. Such doors are extremely heavy, and their hoist mechanism can include several electric motors. An emergency use system typically comprises a crank connected to the axle of the electric motor, which crank is rotated manually. A maximum driving force has been determined for manually rotatable cranks in the technical requirements for overhead doors. In emergency use systems for heavy doors this requires using transmissions, which ease the rotation of the crank, which slows down the opening speed of the door. In spite of the easing transmissions, the use of the manually operated emergency system requires so much force that not everyone can manage that.

[0004] Due to the structure of the worm gearing included in the door hoist mechanism, the emergency use of overhead doors cannot be realized directly from the drive shaft of the lifting equipment, e.g. the shaft of wire coils, but the emergency use has to be carried out by rotating the axle of the electric motor belonging to the hoist mechanism. If the hoist mechanism of the overhead door comprises several electric motors, the axles of all motors have to be rotated simultaneously and with the same speed in an emergency situation. Thus, in manually operated emergency use systems there has to be at least one user for each electric motor, and even then there is no guarantee of the simultaneous use of the emergency operation.

[0005] It is an object of the invention to introduce a hoist mechanism, with which drawbacks related to the prior art can be eliminated.

[0006] The objects of the invention are achieved with a hoist mechanism, which is characterized in what is disclosed in the independent patent claims. Some advantageous embodiments of the invention are disclosed in the dependent claims.

[0007] The invention relates to a hoist mechanism, which comprises a hoist axle, at least one electric motor for rotating the hoist axle, the electric motor having an axle, and an emergency use system for rotating the axle of said electric motor. The emergency use system has been designed to be used when the electric power supply to the electric motor has been disturbed, for example, due to a power cut or a failure in the electric system. In this case the axle of the electric motor can be rotated by the emergency use system, the axle further rotating the hoist axle belonging to the hoist mechanism. In the emergency use system of the invention said hoist mechanism comprises a hydraulic motor, which is connected to the axle of the electric motor by means of a clutch. The hoist mechanism may comprise several electric motors so that an own hydraulic motor is connected to each electric motor with an own clutch. When the emergency use system is not used, the clutch is in a disengaged position so that there is no power transmission connection between the hydraulic motor and electric motor. When the emergency use system is taken into use, the hydraulic motor is engaged to the axle of the electric motor with the clutch, thus generating a power transmission connection between the hydraulic motor and the axle of the electric motor. After this the axles of the electric motors can be rotated by means of the hydraulic motors. The hoist mechanism that is the object of the invention is preferably a hoist mechanism for an overhead door, especially a fabric folding door.

[0008] In an advantageous embodiment of the hoist mechanism of the invention said clutch is an electromagnetic clutch and said emergency use system comprises an emergency power supply independent of the electric power network for engaging the electromagnetic clutch. Engaging refers here to the formation of a power transmission connection between the hydraulic motor and the axle of the electric motor. The electromagnetic clutch can be engaged to the axle of the electric motor fast and easily so that there will be no delays in taking the emergency use system into use. Due to the emergency power supply the clutch also works during power cuts. Preferably said emergency power supply is a battery, and the emergency use system comprises an upkeep charger to be connected to the electric power network for charging the battery. Because of the upkeep charger the battery is always fully charged when the emergency use system is needed.

[0009] In a second advantageous embodiment of the hoist mechanism of the invention said emergency use system comprises a hydraulic mechanism and hydraulic pipes for leading hydraulic fluid from the hydraulic mechanism to the hydraulic motors.

[0010] In a third advantageous embodiment of the hoist mechanism of the invention the hydraulic mechanism comprises a driving motor for producing hydraulic fluid pressure. The driving motor is preferably an electric motor, which is connected to the emergency power supply with power cables. Alternatively the driving motor may

be a combustion engine. It is essential that the driving power required by the hydraulic mechanism can be produced independently of the operation of the electric power network.

[0011] In yet another advantageous embodiment of the hoist mechanism of the invention the emergency use system comprises feed pipes for leading hydraulic fluid to the hydraulic mechanism, the feed pipes having a connection element for connecting to a device producing hydraulic fluid pressure. In this embodiment there is thus no need for an own driving motor producing hydraulic fluid pressure, but the hydraulic fluid pressure is produced by a separate device or work machine not belonging to the mechanism and lead to all hydraulic motors through the hydraulic mechanism. Such a separate working machine can be, for example, a forklift or tractor. In this case it is appropriate to lead the ends of the feed pipes provided with connection elements to such a place, to which the movable work machine has easy access and from where it is possible to connect to the hydraulic system of the work machine. This embodiment of the invention is especially well suited for use in machine shelters and warehouses, in which large numbers of work machines producing hydraulic liquid pressure are typically used or stored.

[0012] In yet another advantageous embodiment of the hoist mechanism of the invention the emergency use system includes a control unit for controlling the use of the hydraulic motor and clutch. The control unit can be connected to the hydraulic motor using a wireless or wired data transmission connection. When using the emergency use system, the control unit first connects a power transmission connection between the hydraulic motor and electric motor by means of the clutch, and immediately after starts the operation of the hydraulic motor. If the hoist mechanism comprises several electric motors, all electric motors and clutches connected to these can be controlled by the same control unit.

[0013] It is an advantage of the invention that the emergency use system belonging to it operates considerably faster and requires substantially less force from the user than manually operated emergency use systems. For example, the opening of overhead doors provided with the invention requires substantially less time and force in an emergency operating situation.

[0014] In addition it is an advantage of the invention that one person is enough to use the emergency use system belonging to it.

[0015] It is further an advantage of the invention that it is structurally simple and operationally reliable.

[0016] The invention will next be explained in detail, referring to the enclosed drawings in which

Figure 1 illustrates in an exemplary manner a hoist mechanism of the invention seen obliquely from the front, and

Figure 2 illustrates an overhead door equipped with a hoist mechanism of the invention.

[0017] In Figure 1 there is illustrated in an exemplary manner a hoist mechanism of the invention seen obliquely from the front. The hoist mechanism illustrated in the figure is a hoist mechanism for an overhead door, especially a fabric folding door. The hoist mechanism comprises an elongated hoist axle 10, a coil 2 provided in the halfway of the length of the hoist axle for a lift wire 106 to be connected to the overhead door. At the first end of the hoist axle there is a first worm gear 12a and a second worm gear 12b is provided to the second end. Both worm gears are of a similar structure. The worm gears have a casing, with a support element 14a, 14b in the outer surface for attaching to the door frame elements. A hole extends through the middle section of the worm gear, to which the end of the hoist axle has been fitted. Worm gears are state of the art technology generally used in hoist mechanisms, and they are not explained in more detail here.

[0018] An electric motor 16 with an axle connected to the worm gear is coupled to each worm gear (the axle of the electric motor is not shown in the figure). The electric motors are intended to be connected to the general electric power network. The axle of the electric motor is in a substantially right angle to the hoist axle 10. The axle of the electric motor extends through the second end surface of the electric motor outside the electric motor casing. At the end of both electric motors there is provided a hydraulic motor 22, which is connected to the end of the axle of the electric motor 16 with an electromagnetic clutch 20. In the normal state of use of the hoist apparatus the electromagnetic clutch is in a disengaged state so that there is no power transmission connection between the hydraulic motor and the electric motor. In the emergency operation mode of the hoist apparatus the electromagnetic clutch is connected to the axle of the electric motor so that power transmission connection is formed between the hydraulic motor and the electric motor. In this case the axle can be rotated by means of the hydraulic motor.

[0019] The hoist mechanism further comprises a hydraulic mechanism 26, which is connected to the hydraulic motors 22 with hydraulic pipes 28. Preferably all hydraulic pipes leading to the hydraulic motors from the hydraulic mechanism are of the substantially same length. This has been found to promote as exact simultaneous use of the hydraulic motors as possible. The hydraulic mechanism, hydraulic motors and hydraulic pipes connecting these contain hydraulic fluid, preferably hydraulic oil. The hydraulic mechanism includes a driving motor 30, the use of which generates hydraulic pressure, which makes the hydraulic fluid to flow from the mechanism to the hydraulic motors. The driving motor illustrated in the figure is an electric motor, which is connected with electric wires 38 to a battery 34 operating as emergency power source. The battery is again connected to an upkeep charger 40 to be connected to the electric power

network with charge wires 36. The driving motor can also be some other than an electric motor, such as a combustion engine. Essential for the driving motor is that its operation is not dependent on the operation of the general electric network.

[0020] The hoist mechanism further includes a control unit 42 for controlling the operation of the electric motors 20, hydraulic mechanism 26 and electromagnetic clutches 20. The control unit is connected to the electric motors, hydraulic mechanism and electromagnetic clutches with wires 39.

[0021] In Figure 2 there is illustrated in an exemplary manner an overhead door, which is provided with the hoist mechanism of the invention. The overhead door illustrated in the figure is an upwards folding fabric overhead door, which has a rectangular flexible door leaf 100. The door leaf comprises two substantially parallel surface fabrics within a distance from each other and a number of horizontal reinforcements between the surface fabrics. The surface fabrics are made of web reinforced PVC fabric or some other sufficiently durable fabric material suitable for the purpose. The lower edge of the door leaf has a capsular lower beam 104 and the upper edge is provided with the hoist mechanism of the invention, which includes the hoist axle 10 with worm gears 12a, 12b at its ends. In the section of the hoist axle between the worm gears there are provided two coils 24, onto which lift wire 106 has been wound. The lift wires travel inside the door leaf between the surface fabrics, their ends attaching to the lower beam 104. The electric motor 16, electromagnetic clutch 20 and hydraulic motor 22 are connected to both worm gears. The operation of the hoist mechanism is controlled by the control unit 42, which is located to the wall adjacent to the overhead door. The battery 34, upkeep charger 40, hydraulic mechanism 26 and driving motor 30 belonging to the hoist mechanism are attached to the wall close to the door opening.

[0022] In a normal operating condition of the overhead door the electric motors 16 obtain their operating energy from the electric network. In this case the hoist mechanism is operated by controlling the operation of the electric motors so that the hoist axle 10 rotates in the desired rotational direction. During power cuts no electric power is obtained from the general electric network so that it is impossible to use the electric motors. In this case it is possible to take into use the emergency use system belonging to the hoist mechanism, which gets the necessary electric power from the battery 34. In an emergency operating situation electric power is coupled from the control unit 42 to the electromagnetic clutches 20, thus creating a power transmission connection between the hydraulic motors 22 and the axle of the electric motors. Hydraulic fluid pressure is produced by the driving motor 30 of the hydraulic mechanism 26, which makes the hydraulic motor to rotate the axle of the electric motor in the desired direction of rotation. The rotational movement of the axle of the electric motor is converted into rotational movement of the hoist axle 10 and the coils 24 attached to it by means of the worm gears 12a, 12b so that lift wire 106 is either uncoiled from or coiled to the coil. Thus it is possible to raise or lower the overhead door with the emergency operating mechanism according to need.

[0023] In an advantageous embodiment of the invention there are provided all other above-mentioned elements of the hoist mechanism, with the exception of the driving motor 30 of the hydraulic mechanism 26. The mechanism has instead feed pipes for the hydraulic fluid, the first end of which is connected to the hydraulic mechanism, and the second end being equipped with a connection element for connecting to a device or work machine generating hydraulic fluid pressure and not belonging to the hoist mechanism. Such a device not being part of the hoist mechanism can be, for example, a forklift or tractor. In this embodiment the emergency use system is used exactly in the same way as in the invention presented above. The only difference is that the hydraulic fluid pressure needed by the emergency use system is generated by a separate device, which is not part of the hoist mechanism.

[0024] Some advantageous embodiments of the hoist mechanism of the invention have been explained above. The invention is not limited to the solutions disclosed above, but the inventional idea may be applied in different ways within the limits set by the patent claims.

Claims

1. Hoist mechanism comprising a hoist axle (10), at least one electric motor (16) for rotating the hoist axle (10), the electric motor having an axle, and an emergency use system for rotating the axle of the said electric motor (16), **characterized in that** the said emergency use system comprises a hydraulic motor (22), which is connected to the axle of the electric motor (16) by means of a clutch (20).

2. Hoist mechanism according to claim 1, **characterized in that** said clutch (20) is an electromagnetic clutch (20) and said emergency use system comprises an emergency power supply independent of the electric power network for engaging the electromagnetic clutch (20).

3. Hoist mechanism according to claim 2, **characterized in that** the said emergency power supply is a battery (34) and the emergency use system comprises an upkeep charger (40) to be connected to the electric power network for charging the battery (34).

4. Hoist mechanism according to any one of the claims 1-3, **characterized in that** the said emergency use system comprises a hydraulic mechanism (26) and hydraulic pipes (28) for leading hydraulic fluid from the hydraulic mechanism (26) to the hydraulic motor

(22).

5. Hoist mechanism according to claim 4, **characterized in that** the said hydraulic mechanism (26) comprises a driving motor (30) for producing hydraulic fluid pressure.

6. Hoist mechanism according to claim 5, **characterized in that** the said driving motor (30) is an electric motor connected to the emergency power supply with power cables (38).

7. Hoist mechanism according to claim 5, **characterized in that** the said driving motor (30) is a combustion engine.

8. Hoist mechanism according to claim 4, **characterized in that** the said emergency use system comprises feed pipes for leading hydraulic fluid to the hydraulic mechanism (26), the feed pipes having a connection element for connecting to a device producing hydraulic fluid pressure.

9. Hoist mechanism according to one of the claims 1-8, **characterized in that** the emergency use system includes a control unit (42) for controlling the use of the hydraulic motor (22) and clutch (20).

10. Hoist mechanism according to one of the claims 1-9, **characterized in that** it is a hoist mechanism for an overhead door (100).

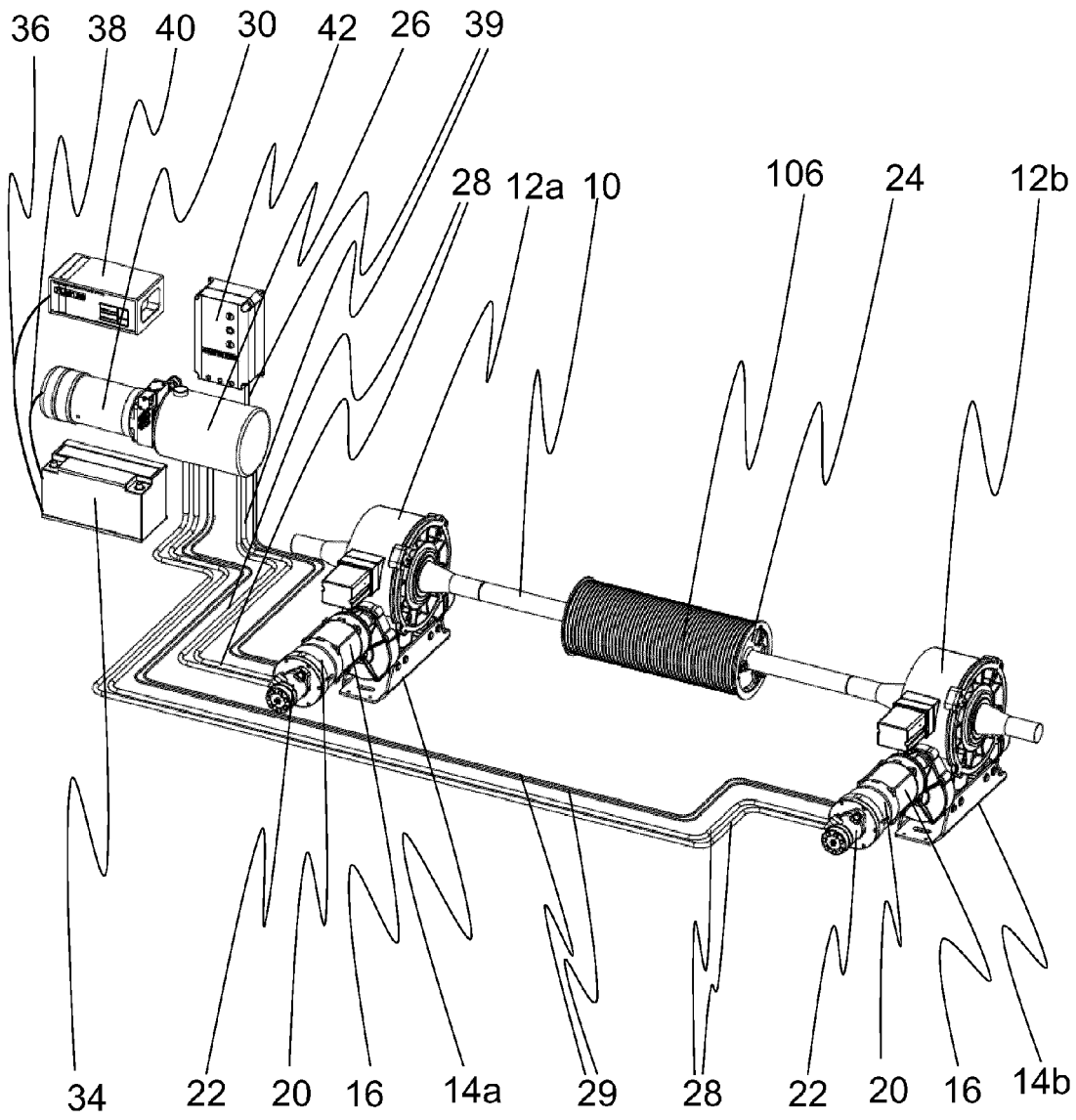
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Fig. 1

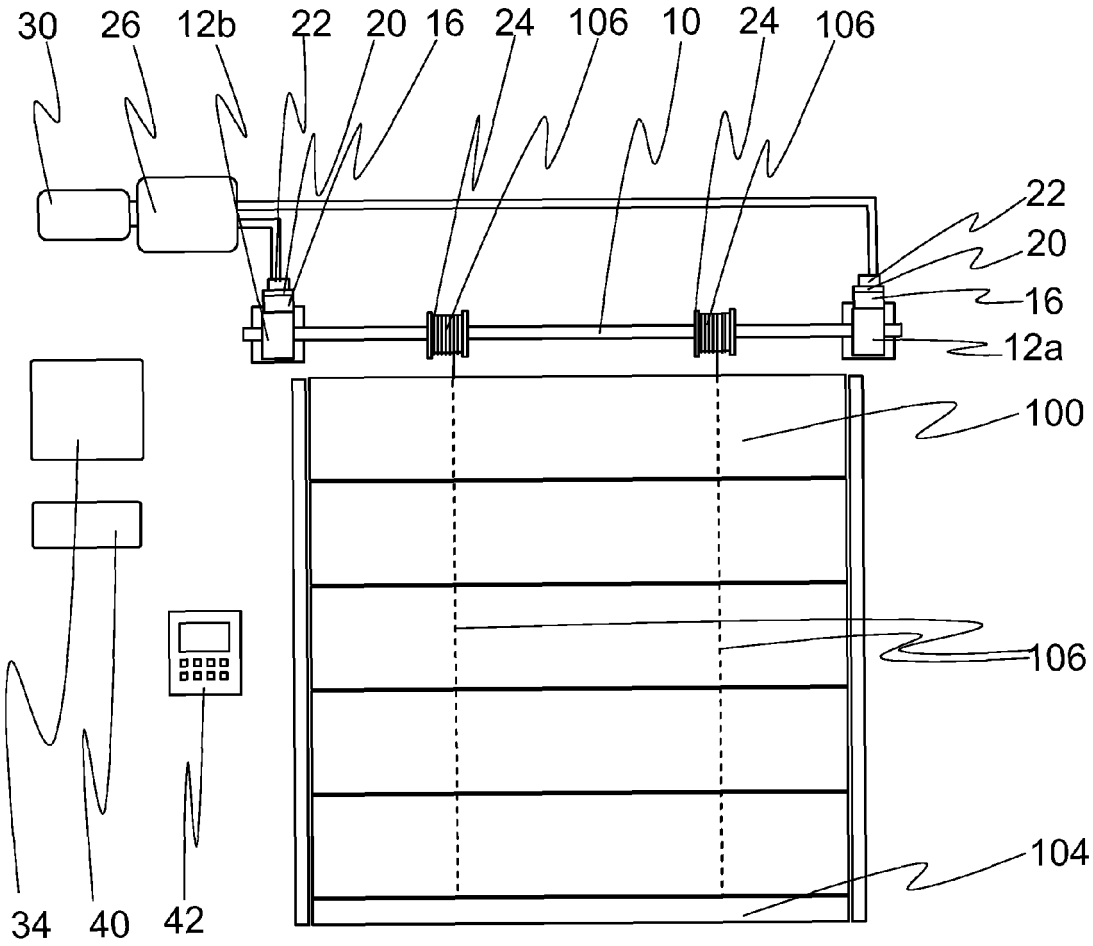

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 15 18 1487

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	WO 2013/147613 A1 (I P HUSE AS [NO]) 3 October 2013 (2013-10-03) * page 4, line 27 - page 6, line 5 * * figure 1 * -----	1,4,5,8, 9 2,3,6,7, 10	INV. E05F15/59 B66D1/08 B66D1/12 E05F15/686
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TECHNICAL FIELDS SEARCHED (IPC)
E05F
B66D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 December 2015	Prieto, Daniel

CATEGORY OF CITED DOCUMENTS

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