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(54) **AUTOMATIC TRANSFER SWITCHING EQUIPMENT AND MANUAL OPERATING MECHANISM THEREOF**

(57) Disclosed are a manual operating mechanism and an automatic transfer switching equipment. the manual operating mechanism comprises: a handle gear pivotally mounted on a frame; a handle connecting with the handle gear such that the handle gear is capable of rotating with the handle, the handle being capable of moving between a first position corresponding to the OFF position, a second position corresponding to the first power supply ON position and a third position corresponding to the second power supply ON position; a first ener-

gy-storing gear pivotally mounted on the frame, wherein the first energy-storing gear is capable of engage with the handle gear to rotate during the rotation of the handle gear; a first driving gear pivotally mounted on the frame and being coaxial with the first energy-storing gear; a first elastic element provided on the first energy-storing gear at one end and provided on the first driving gear at the other end; a central wheel pivotally mounted on the frame and being capable of driving the main shaft of the automatic transfer switching equipment to rotate.

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Description

TECHNICAL FIELD

[0001] The present application relates to a manual operating mechanism for automatic transfer switching equipment and an automatic transfer switching equipment comprising such a manual operating mechanism.

BACKGROUND

[0002] Automatic transfer switching equipment (ATSE) is used for power supply and the reliability of the ATSE is important for users. The operating mechanism of the ATSE is a key component for the reliability. It is important to provide an easy and reliable operating mechanism.

[0003] There are two types of operating mechanism, one is electrical operating mechanism and the other is manual operating mechanism. Generally, the electrical operating mechanism is used to control the transfer of the ATSE, but in the case that the electrical operating mechanism is failed or needs repair, the manual operating mechanism is used to control the transfer of the ATSE. There are two types of manual operating mechanism, one is manpower manual operating mechanism and non-manpower manual operating mechanism. Current manual operating mechanism is manpower manual operating mechanism, which requires users to disconnect the power supply or the load when operating, otherwise a serious safety problem may be occurred since the electric arc generated between the mobile contact and the fixed contact is uncontrollable, which is undesirable for the users.

[0004] Thereby, there is a need to provide a non-manpower manual operating mechanism that can control the electric arc generated between the mobile contact and the fixed contact within an allowable range such that it is not necessary to disconnect the power supply or the load.

SUMMARY

[0005] In view of above-mentioned problems in the prior art, the present application proposes a manual operating mechanism for automatic transfer switching equipment, the automatic transfer switching equipment being capable of transfer between an OFF position, a first power supply ON position and a second power supply ON position, characterized in that the manual operating mechanism comprises: a handle gear pivotally mounted on a frame; a handle connecting with the handle gear such that the handle gear is capable of rotating with the handle, the handle being capable of moving between a first position corresponding to the OFF position, a second position corresponding to the first power supply ON position and a third position corresponding to the second power supply ON position; a first energy-storing gear pivotally mounted on the frame, wherein the first energy-

storing gear is capable of engage with the handle gear to rotate during the rotation of the handle gear; a first driving gear pivotally mounted on the frame and being coaxial with the first energy-storing gear; a first elastic element provided on the first energy-storing gear at one end and provided on the first driving gear at the other end; a central wheel pivotally mounted on the frame and being capable of driving the main shaft of the automatic transfer switching equipment to rotate, wherein in the case that the automatic transfer switching equipment is at OFF position and the handle is at the first position, when the handle is rotated towards the second position along a first direction, the handle gear is also rotated along the first direction to engage with the first energy-storing gear, such that the first energy-storing gear rotates along a second direction opposite to the first direction and at this time the first driving gear is unable to rotate in the second direction due to the first stopper provided on the frame, wherein with the rotating of the first energy-storing gear, the first elastic element will deform to store energy and when the first elastic element passes a "dead point", the first driving gear rotates along the first direction upon the elastic force of the first elastic element to engage with the central wheel such that the central wheel rotates along the second direction to force the main shaft of the automatic transfer switching equipment to rotate to transfer the automatic transfer switching equipment to the first power supply position and at last the first driving gear is unable to rotate along the first direction due to the second stopper provided on the frame.

[0006] Preferably, in the case that the automatic transfer switching equipment is at the first power supply position and the handle is at the second position, when the handle is rotated towards the first position along the second direction, the handle gear is also rotated along the second direction to engage with the first energy-storing gear, such that the first energy-storing gear rotates along the first direction and at this time the first driving gear is unable to rotate in the first direction due to the second stopper provided on the frame, wherein with the rotating of the first energy-storing gear, the first elastic element will deform to store energy and when the first elastic element passes a "dead point", the first driving gear rotates along the second direction upon the elastic force of the first elastic element to engage with the central wheel such that the central wheel rotates along the first direction to force the main shaft of the automatic transfer switching equipment to rotate to transfer the automatic transfer switching equipment to the OFF position and at last the first driving gear is unable to rotate along the second direction due to the first stopper.

[0007] Preferably, the manual operating mechanism further comprises: a second energy-storing gear pivotally mounted on the frame, wherein the second energy-storing gear is capable of engage with the handle gear to rotate during the rotation of the handle gear; a second driving gear, pivotally mounted on the frame and being coaxial with the second energy-storing gear; a second

elastic element provided on the second energy-storing gear at one end and provided on the second driving gear at the other end, wherein in the case that the automatic transfer switching equipment is at OFF position and the handle is at the first position, when the handle is rotated towards the third position along the second direction, the handle gear is also rotated along the second direction to engage with the second energy-storing gear, such that the second energy-storing gear rotates along the first direction and at this time the second driving gear is unable to rotate in the first direction due to the third stopper provided on the frame, wherein with the rotating of the second energy-storing gear, the second elastic element will deform to store energy and when the second elastic element passes a "dead point", the second driving gear rotates along the second direction upon the elastic force of the second elastic element to engage with the central wheel such that the central wheel rotates along the first direction to force the main shaft of the automatic transfer switching equipment to rotate to transfer the automatic transfer switching equipment to the second power supply position and at last the second driving gear is unable to rotate along the second direction due to the fourth stopper provided on the frame.

[0008] Preferably, in the case that the automatic transfer switching equipment is at the second power supply ON position and the handle is at the third position, when the handle is rotated towards the first position along the first direction, the handle gear is also rotated along the first direction to engage with the second energy-storing gear, such that the second energy-storing gear rotates along the second direction and at this time the second driving gear is unable to rotate in the second direction due to the fourth stopper provided on the frame, wherein with the rotating of the second energy-storing gear, the second elastic element will deform to store energy and when the second elastic element passes a "dead point", the second driving gear rotates along the first direction upon the elastic force of the second elastic element to engage with the central wheel such that the central wheel rotates along the second direction to force the main shaft of the automatic transfer switching equipment to rotate to transfer the automatic transfer switching equipment to the OFF position and at last the second driving gear is unable to rotate along the first direction due to the third stopper.

[0009] Preferably, the teeth of the handle gear are only arranged on a portion of the circumference of the handle gear such that the handle gear is not engaged with the second energy-storing gear when the handle gear is engaged with the first energy-storing gear and the handle gear is not engaged with the first energy-storing gear when the handle gear is engaged with the second energy-storing gear.

[0010] Preferably, the teeth of the first driving gear are only arranged on a portion of the circumference of the first driving gear such that the central wheel is not engaged with the teeth of the first driving gear when the

second driving gear is engaged with the central wheel. The teeth of the second driving gear are only arranged on a portion of the circumference of the second driving gear such that the central wheel is not engaged with the teeth of the second driving gear when the first driving gear is engaged with the central wheel.

[0011] Preferably, the handle gear, the first driving gear and the second driving gear are external gear or internal gear.

[0012] The present application also proposes an automatic transfer switching equipment comprising the manual operating mechanism described above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Features and advantages of the present application will become more apparent from following detailed description of specific embodiments of the present application with reference to attached drawings, in which:

FIG. 1 shows a manual operating mechanism according to the present application in which the handle of the manual operating mechanism is at a first position corresponding to OFF position.

FIG. 2 is a schematic view showing the handle of the manual operating mechanism transfers from the first position to the second position in which the first elastic element does not pass a "dead point".

FIG. 3 is a schematic view showing the handle of the manual operating mechanism transfers from the first position to the second position in which the first elastic element passes a "dead point".

FIG. 4 is a schematic view showing the handle of the manual operating mechanism transfers from the first position to the second position in which the automatic transfer switching equipment has transferred to the first power supply ON position.

FIG. 5 is a schematic view showing the handle of the manual operating mechanism transfers from the second position to the first position in which the first elastic element passes a "dead point".

FIG. 6 is a schematic view showing the handle of the manual operating mechanism transfers from the second position to the first position the automatic transfer switching equipment is transferring to the OFF position.

FIG. 7 is a schematic view showing the handle of the manual operating mechanism transfers from the first position to the third position in which the second elastic element passes a "dead point".

FIG. 8 is a schematic view showing the handle of the manual operating mechanism transfers from the first position to the third position in which the automatic transfer switching equipment has transferred to the second power supply ON position.

DETAILED DESCRIPTION

[0014] Various exemplary embodiments of the present application will be described below with reference to the accompanying drawings.

[0015] The foregoing and other technical contents, features, and effects of the present application will be clearly apparent from the following detailed description of the embodiments with reference to the attached drawings. Directional terms mentioned in the following embodiments, such as: up, down, left, right, front, back, etc., are simply directions with reference to the drawings. Therefore, the directional terms are used to illustrate and not to limit the present application. In addition, in all the embodiments, same reference numbers denote same elements.

[0016] The drawings of the description show the shape and relationship of the various components. Note that, the drawings are illustrative and used to describe the concept of the present application.

[0017] Hereafter, a preferable embodiment of the present application is described with reference to Fig. 1 to Fig. 8.

[0018] Firstly, referring to Fig. 1, a manual operating mechanism of the present application is shown. The handle of the manual operating mechanism is at the first position corresponding to the OFF position of the ATSE and at the same time the ATSE is at OFF position.

[0019] The manual operating mechanism comprises a handle 1 which is capable of moving between a first position corresponding to the OFF position, a second position corresponding to the first power supply ON position and a third position corresponding to the second power supply ON position. A handle gear 2 is pivotally mounted on a frame and fixedly connected with the handle such that the handle gear 2 is capable of rotating with the handle 1. A first energy-storing gear 3 and a second energy-storing gear 4 are pivotally mounted on the frame and are capable of engaging with the handle gear 2 during the rotation of the handle gear such that the first energy-storing gear and a second energy-storing gear can rotate. A first driving gear 5 is pivotally mounted on the frame and is coaxial with the first energy-storing gear 3. A second driving gear 6 is pivotally mounted on the frame and is coaxial with the second energy-storing gear 4. A first elastic element 7 is provided between the first energy-storing gear 3 and the first driving gear 5. A second elastic element 8 is provided between the second energy-storing gear 4 and the second driving gear 6. As described below, the first driving gear 5 and the second driving gear 6 are respectively rotated via the elastic force of the first elastic element 7 and the second elastic element 8 to engage with a central wheel 9. The central wheel 9 is connected with a main shaft of the ATSE such that the rotation of the central wheel makes the main shaft rotate and thereby the mobile contact of the ATSE switches between the OFF position, the first power supply ON position and the second power supply ON position.

[0020] Hereafter, a process of switching the ATSE from the OFF position to the first power supply ON position by switching the handle of the manual operating mechanism from the first position to the second position is described with reference to Figs.2-4.

[0021] When the handle 1 is rotated in counter-clockwise direction, the handle gear 2 is also rotated in counter-clockwise direction. The handle gear will engage with the first energy-storing gear 3 during the rotation in counter-clockwise direction such that the first energy-storing gear 3 rotates in clockwise direction and the first elastic element 7 which is mounted on the first energy-storing gear at one end deforms and stores energy. At this time, the first driving gear 5 remains stationary by a first stopper mounted on the frame. The first stopper prevents the first driving gear from rotating in clockwise direction upon the action of the first elastic element 7. After the first elastic element 7 passes a "dead point", as shown in Fig.3, the first driving gear 5 will rotate in counter-clockwise direction upon the elastic force of the first elastic element 7. The "dead point" is defined as a position in which the elastic force applied to the first energy-storing gear 3 by the first elastic element is coincided with the central axis of the first energy-storing gear. Then, the first driving gear 5 rotates in counter-clockwise direction to engage with the central wheel 9, causing the central wheel rotates in clockwise direction and the main shaft of the ATSE rotates correspondingly to switch to the first power supply ON position, as shown in Fig. 4.

[0022] Hereafter, a process of switching the ATSE from the first power supply ON position to the OFF position by switching the handle of the manual operating mechanism from the second position to the first position is described with reference to Figs.5-6.

[0023] As shown in Fig.4, the handle is at the second position and the ATSE is at the first power supply ON position. When the handle 1 is rotated in clockwise direction, the handle gear 2 is also rotated in clockwise direction. The handle gear will engage with the first energy-storing gear 3 during the rotation in clockwise direction such that the first energy-storing gear rotates in counter-clockwise direction, and the first elastic element 7 which is mounted on the first energy-storing gear at one end deforms and stores energy. At this time, the first driving gear 5 remains stationary by a second stopper mounted on the frame. The second stopper prevents the first driving gear from rotating in counter-clockwise direction upon the action of the first elastic element 7. After the first elastic element 7 passes a "dead point", the first driving gear 5 will rotate in clockwise direction upon the elastic force of the first elastic element 7. Then, the first driving gear 5 rotates in clockwise direction to engage with the central wheel 9, causing the central wheel 9 rotates in counter-clockwise direction and the main shaft of the ATSE rotates correspondingly to switch to the OFF position.

[0024] In the following, a process of switching the ATSE from the OFF position to the second power supply

ON position by switching the handle of the manual operating mechanism from the first position to the third position is described with reference to Figs.7-8.

[0025] When the handle 1 is rotated in clockwise direction, the handle gear 2 is also rotated in clockwise direction. The handle gear will engage with the second energy-storing gear 4 during the rotation in clockwise direction such that the second energy-storing gear rotates in counter-clockwise direction and the second elastic element 8 which is mounted on the second energy-storing gear at one end deforms and stores energy. At this time, the second driving gear 6 remains stationary by a third stopper mounted on the frame. The third stopper prevents the second driving gear from rotating in counter-clockwise direction upon the action of the second elastic element 8. After the second elastic element 8 passes a "dead point", as shown in Fig.7, the second driving gear 6 will rotate in clockwise direction upon the elastic force of the second elastic element 8. The "dead point" is defined as a position in which the elastic force applied to the second energy-storing gear 4 by the second elastic element is coincided with the central axis of the second energy-storing gear. Then, the second driving gear 6 rotates in clockwise direction to engage with the central wheel 9, causing the central wheel 9 rotates in counter-clockwise direction and the main shaft of the ATSE rotates correspondingly to switch to the second power supply ON position, as shown in Fig. 8.

[0026] Note that, the teeth of the handle gear 2, the first driving gear 5 and the second driving gear 6 are only arranged on a portion of the circumference. During operation, the handle gear can only engage with one of the first energy-storing gear and the second energy-storing gear and cannot engage with both of the first energy-storing gear and the second energy-storing gear at the same time. During operation, only one of the first driving gear and the second driving gear can engage with the central wheel and the central wheel cannot engage with both of the first driving gear and the second driving gear at the same time. Particularly, when the handle rotates from the first position to the second position or from the second position to the first position, the handle gear 2 can only engage with the first energy-storing gear and cannot engage with the second energy-storing gear. Only the first driving gear can engage with the central wheel and the second driving gear cannot engage with the central wheel. When the handle rotates from the first position to the third position or from the third position to the first position, the handle gear 2 can only engage with the second energy-storing gear and cannot engage with the first energy-storing gear. Only the second driving gear can engage with the central wheel and the first driving gear cannot engage with the central wheel.

[0027] In addition, in the present example, the handle gear, the first driving gear and the second driving gear are internal gear, but the handle gear, the first driving gear and the second driving gear can also be external gear.

[0028] A manual operating mechanism comprising a handle gear, energy-storing gears, driving gears and a central wheel is described above. Due to the manual operating mechanism of the present application, during the switching of the ATSE, the rotating speed of the mobile contact is irrelevant to the switching speed of the ATSE and the electric arc generated between the mobile contact and the fixed contact is controllable within an allowable range, and thereby it is not necessary to disconnect the power supply or the load.

[0029] A process of switching the ATSE from the OFF position to the first power supply ON position by switching the handle of the manual operating mechanism from the first position to the second position, a process of switching the ATSE from the first power supply ON position to the OFF position by switching the handle of the manual operating mechanism from the second position to the first position and a process of switching the ATSE from the OFF position to the second power supply ON position by switching the handle of the manual operating mechanism from the first position to the third position are described above, but based on the teaching of the present application, a skilled person can conceive of switching the handle of the manual operating mechanism from the third position to the first position.

[0030] Although the present application has been described in the specification and illustrated in the accompanying drawings on the basis of the above embodiments, it will be understood by those skilled in the art that the above embodiments are only preferred embodiments. The present application is not limited to the above embodiments. Of course, the embodiments shown in the drawings of the present application are preferable embodiments, which may have outstanding substantive features and significant progress compared to other alternatives or variant embodiments not shown.

Claims

1. A manual operating mechanism for automatic transfer switching equipment, the automatic transfer switching equipment being capable of transfer between an OFF position, a first power supply ON position and a second power supply ON position, **characterized in that** the manual operating mechanism comprises:

a handle gear pivotally mounted on a frame;
a handle connecting with the handle gear such that the handle gear is capable of rotating with the handle, the handle being capable of moving between a first position corresponding to the OFF position, a second position corresponding to the first power supply ON position and a third position corresponding to the second power supply ON position;
a first energy-storing gear pivotally mounted on

the frame, wherein the first energy-storing gear is capable of engage with the handle gear to rotate during the rotation of the handle gear;
a first driving gear pivotally mounted on the frame and being coaxial with the first energy-storing gear;

a first elastic element provided on the first energy-storing gear at one end and provided on the first driving gear at the other end;

a central wheel pivotally mounted on the frame and being capable of driving the main shaft of the automatic transfer switching equipment to rotate,

wherein in the case that the automatic transfer switching equipment is at OFF position and the handle is at the first position, when the handle is rotated towards the second position along a first direction, the handle gear is also rotated along the first direction to engage with the first energy-storing gear, such that the first energy-storing gear rotates along a second direction opposite to the first direction and at this time the first driving gear is unable to rotate in the second direction due to the first stopper provided on the frame, wherein with the rotating of the first energy-storing gear, the first elastic element will deform to store energy and when the first elastic element passes a "dead point", the first driving gear rotates along the first direction upon the elastic force of the first elastic element to engage with the central wheel such that the central wheel rotates along the second direction to force the main shaft of the automatic transfer switching equipment to rotate to transfer the automatic transfer switching equipment to the first power supply position and at last the first driving gear is unable to rotate along the first direction due to the second stopper provided on the frame.

2. The manual operating mechanism according to claim 1, **characterized in that** in the case that the automatic transfer switching equipment is at the first power supply position and the handle is at the second position, when the handle is rotated towards the first position along the second direction, the handle gear is also rotated along the second direction to engage with the first energy-storing gear, such that the first energy-storing gear rotates along the first direction and at this time the first driving gear is unable to rotate in the first direction due to the second stopper provided on the frame, wherein with the rotating of the first energy-storing gear, the first elastic element will deform to store energy and when the first elastic element passes a "dead point", the first driving gear rotates along the second direction upon the elastic force of the first elastic element to engage with the central wheel such that the central wheel rotates along the first direction to force the main shaft of the

automatic transfer switching equipment to rotate to transfer the automatic transfer switching equipment to the OFF position and at last the first driving gear is unable to rotate along the second direction due to the first stopper.

3. The manual operating mechanism according to claim 1 or 2, **characterized in that** the manual operating mechanism further comprises:

a second energy-storing gear pivotally mounted on the frame, wherein the second energy-storing gear is capable of engage with the handle gear to rotate during the rotation of the handle gear;

a second driving gear, pivotally mounted on the frame and being coaxial with the second energy-storing gear;

a second elastic element provided on the second energy-storing gear at one end and provided on the second driving gear at the other end, wherein in the case that the automatic transfer switching equipment is at OFF position and the handle is at the first position, when the handle is rotated towards the third position along the second direction, the handle gear is also rotated along the second direction to engage with the second energy-storing gear, such that the second energy-storing gear rotates along the first direction and at this time the second driving gear is unable to rotate in the first direction due to the third stopper provided on the frame, wherein with the rotating of the second energy-storing gear, the second elastic element will deform to store energy and when the second elastic element passes a "dead point", the second driving gear rotates along the second direction upon the elastic force of the second elastic element to engage with the central wheel such that the central wheel rotates along the first direction to force the main shaft of the automatic transfer switching equipment to rotate to transfer the automatic transfer switching equipment to the second power supply position and at last the second driving gear is unable to rotate along the second direction due to the fourth stopper provided on the frame.

4. The manual operating mechanism according to claim 3, **characterized in that** in the case that the automatic transfer switching equipment is at the second power supply ON position and the handle is at the third position, when the handle is rotated towards the first position along the first direction, the handle gear is also rotated along the first direction to engage with the second energy-storing gear, such that the second energy-storing gear rotates along the second direction and at this time the second driving gear

is unable to rotate in the second direction due to the fourth stopper provided on the frame, wherein with the rotating of the second energy-storing gear, the second elastic element will deform to store energy and when the second elastic element passes a "dead point", the second driving gear rotates along the first direction upon the elastic force of the second elastic element to engage with the central wheel such that the central wheel rotates along the second direction to force the main shaft of the automatic transfer switching equipment to rotate to transfer the automatic transfer switching equipment to the OFF position and at last the second driving gear is unable to rotate along the first direction due to the third stopper.

5. The manual operating mechanism according to claim 4, **characterized in that** the teeth of the handle gear are only arranged on a portion of the circumference of the handle gear such that the handle gear is not engaged with the second energy-storing gear when the handle gear is engaged with the first energy-storing gear and the handle gear is not engaged with the first energy-storing gear when the handle gear is engaged with the second energy-storing gear.
6. The manual operating mechanism according to claim 5, **characterized in that** the teeth of the first driving gear are only arranged on a portion of the circumference of the first driving gear such that the central wheel is not engaged with the teeth of the first driving gear when the second driving gear is engaged with the central wheel. The teeth of the second driving gear are only arranged on a portion of the circumference of the second driving gear such that the central wheel is not engaged with the teeth of the second driving gear when the first driving gear is engaged with the central wheel.
7. The manual operating mechanism according to claim 6, **characterized in that** the handle gear, the first driving gear and the second driving gear are external gear or internal gear.
8. An automatic transfer switching equipment comprising the manual operating mechanism according to any one of claims 1 to 7.

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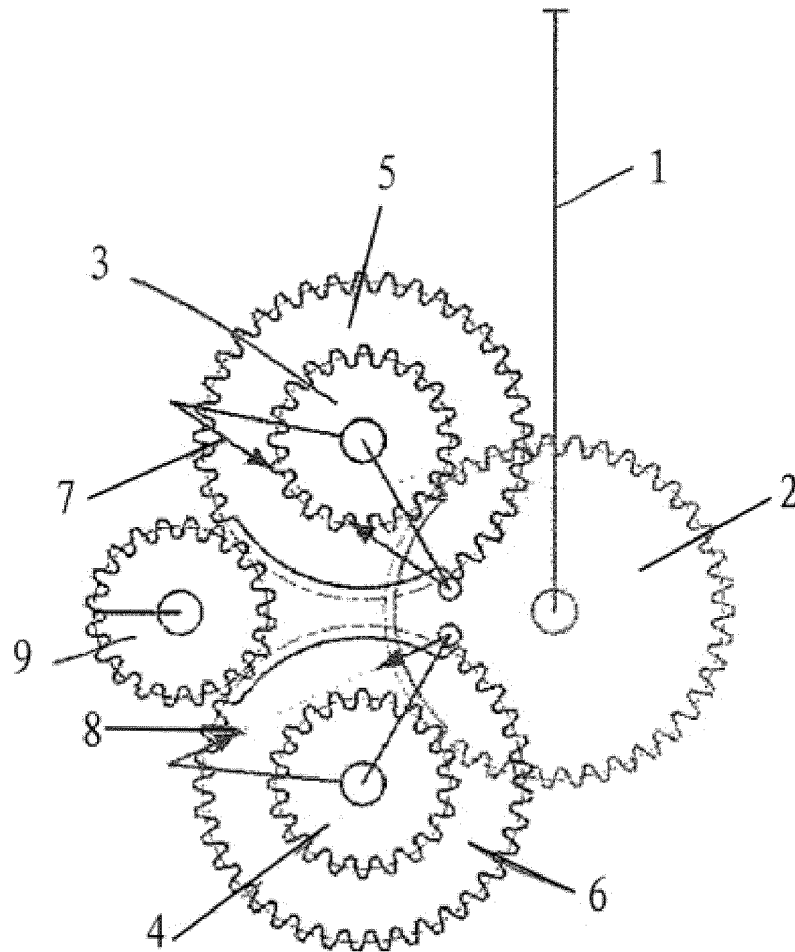


Fig. 1

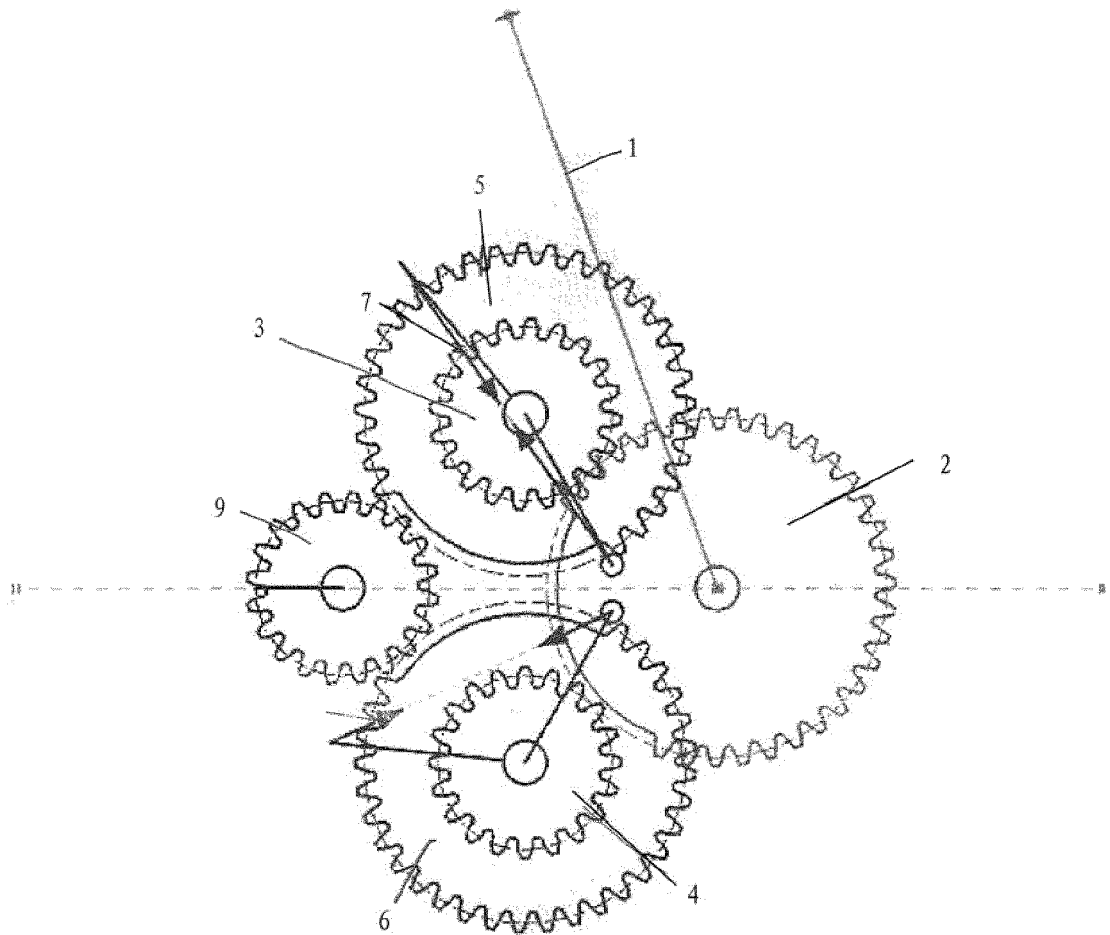


Fig. 2

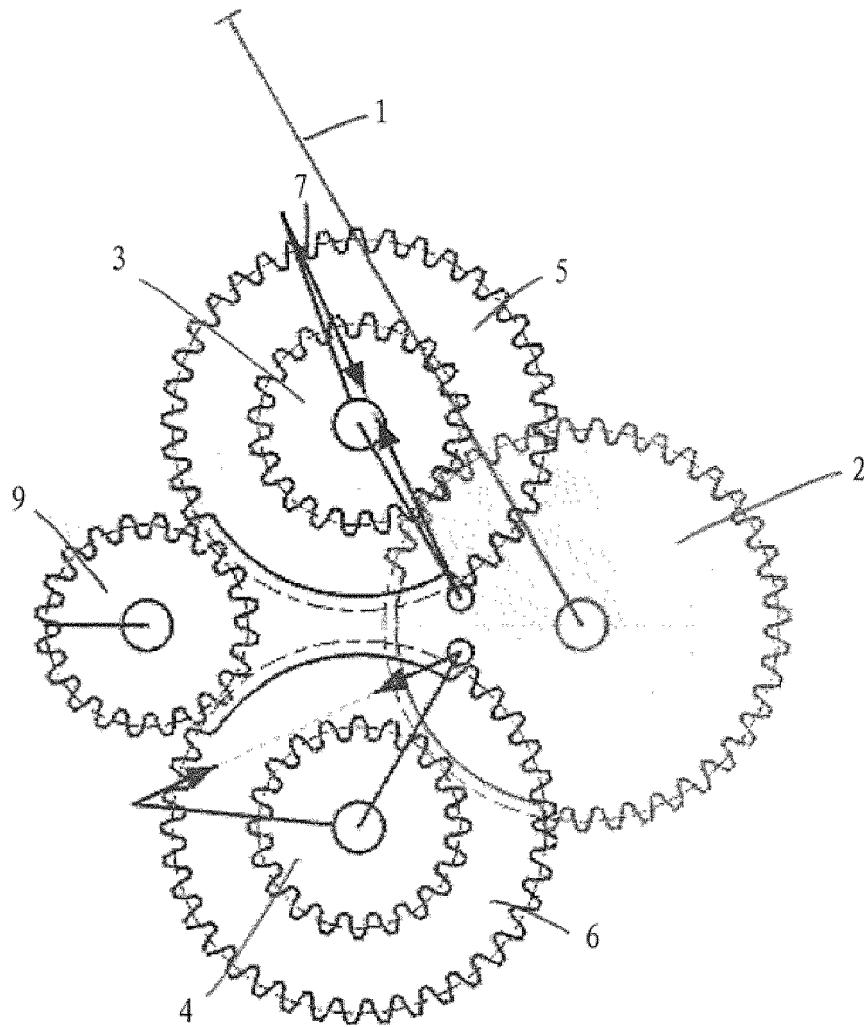


Fig. 3

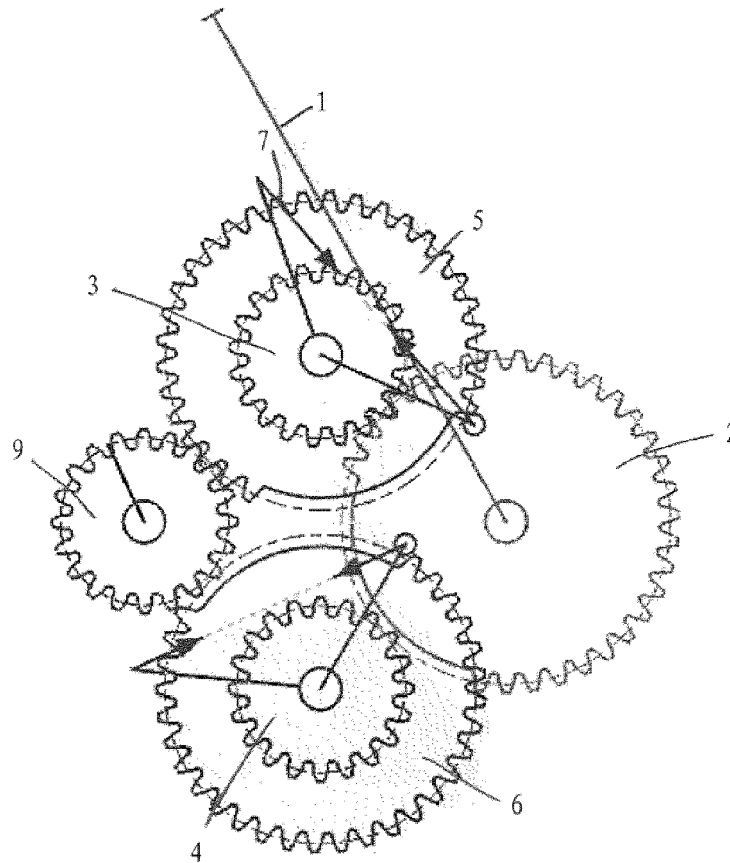


Fig. 4

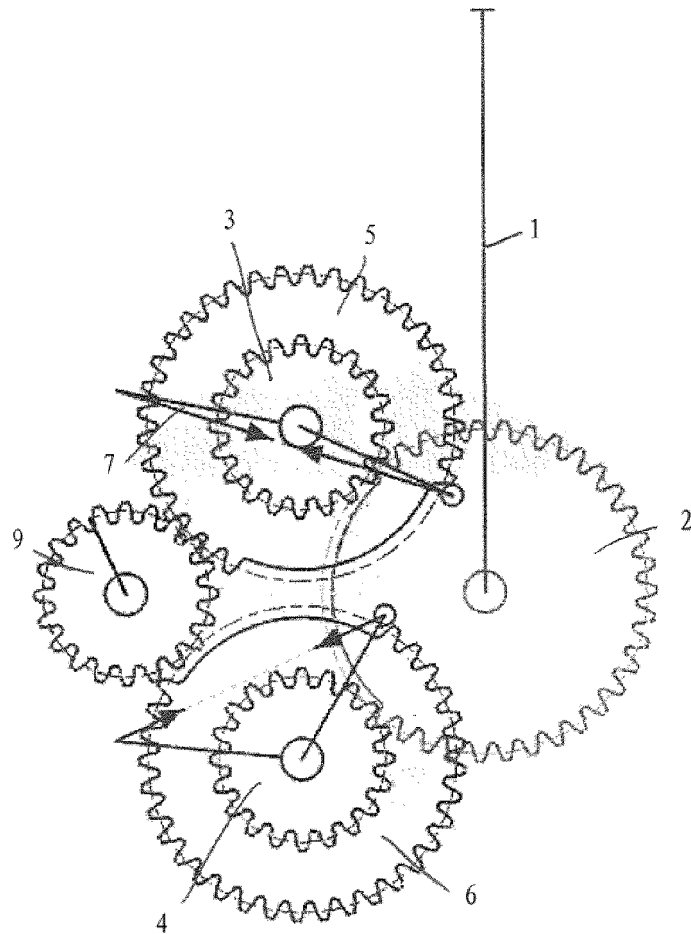


Fig. 5

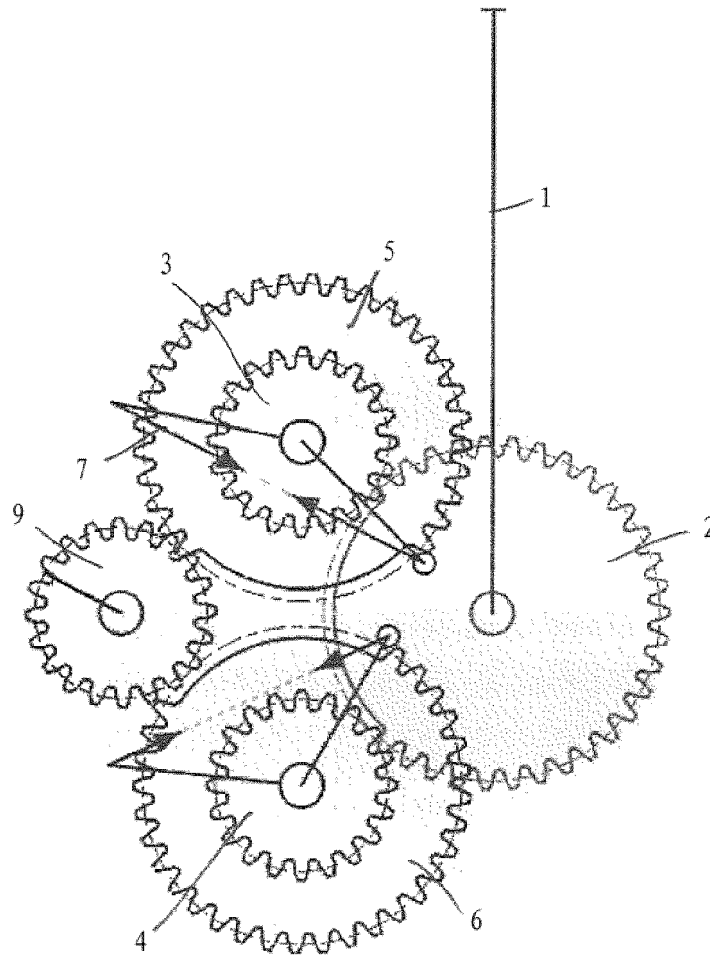


Fig. 6

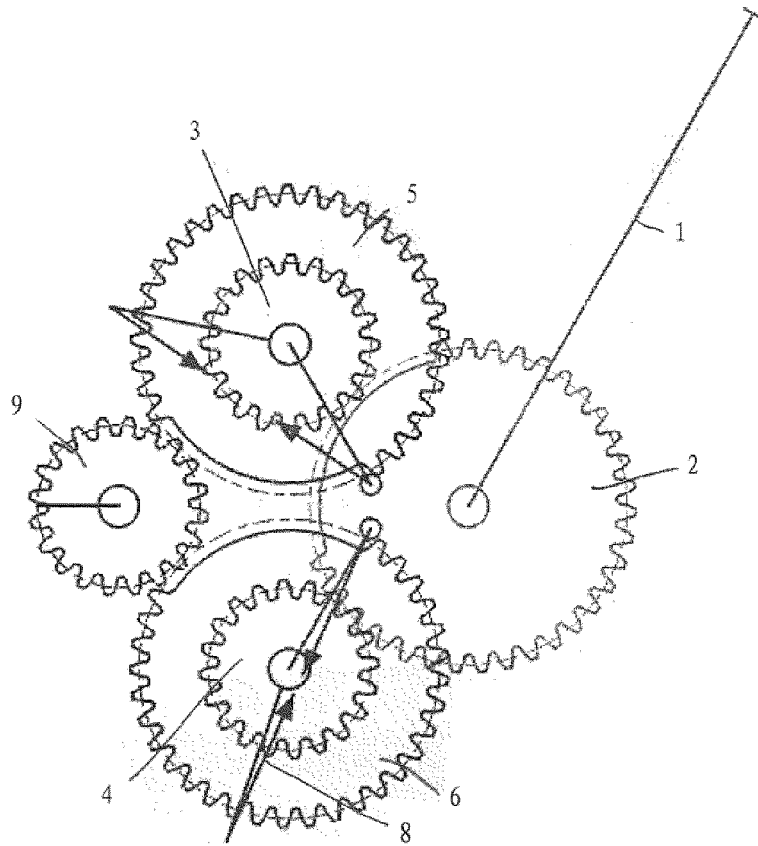


Fig. 7

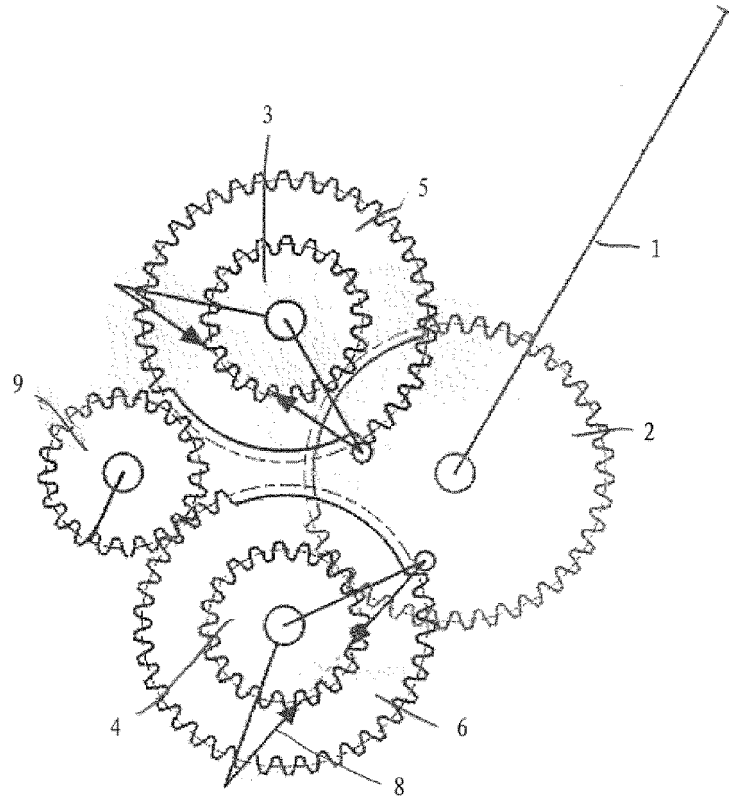


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
EP 18 20 6039

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 March 2019	Examiner Serrano Funcia, J
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