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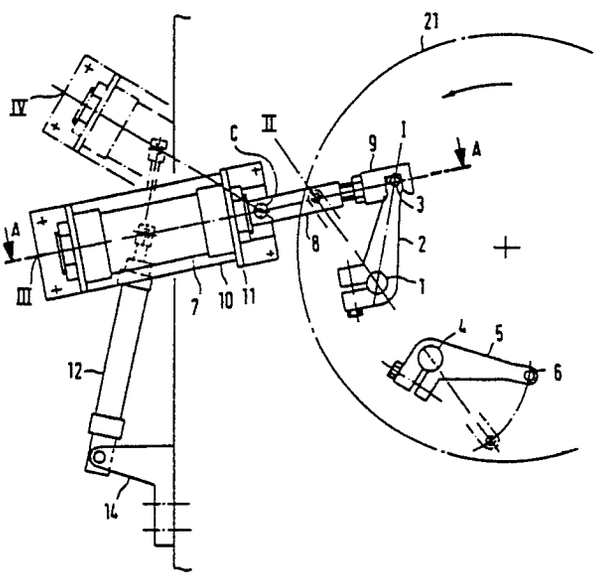
(54) Automatic printing plate-tightening device for sheet-fed printing machine.

(57) There is disclosed an automatic printing plate-tightening device for use with a sheet-fed printing machine. A first cam shaft extends from the front portion of a plate cylinder. A second cam shaft extends from the rear portion of the cylinder. Two arms are rotatably mounted on the first and the second cam shafts, respectively. A first cylinder can be connected with one or the other of the two arms to rotate it. The orientation of the first cylinder is switched between two positions by a second cylinder which is connected to the first cylinder.

Fig.1



EP 0 260 492 A2

AUTOMATIC PRINTING PLATE-TIGHTENING DEVICE FOR SHEET-FED PRINTING MACHINE

FIELD OF THE INVENTION

The present invention relates to an automatic printing plate-tightening device for use with a sheet-fed printing machine.

BACKGROUND OF THE INVENTION

A manual printing plate-tightening device which has been frequently used in recent years is shown in Figs. 5 - 7. Fig. 5 shows the condition in which upper teeth are open. Fig. 6 shows the condition in which the upper teeth are closed to tighten a printing plate. Fig. 7 is a plan view of the manual printing plate-tightening device. A plate cylinder 01 is equipped with platetightening devices 03r and 03e. Each time the printed item is varied, a preparation time is required. This time greatly affects the rate of operation of a printing machine. A time taken to exchange the printing plate accounts for a considerable proportion of the preparation time. In order to enhance the rate of operation of a printing machine by reducing the time taken to exchange the printing plate, various devices have been invented.

The time taken to exchange a printing plate differs considerably among printing sites. Statistics shows the average time. The time taken to operate an eccentric shaft, or cam shaft, for tightening a printing plate and bolts for stretching the plate accounts for most of the exchange time.

In Figs. 5 and 6, the right side to the vertical center line is the front portion of the printing plate, while the left side is the rear portion. The plate cylinder 01 is provided with a recess 02 in which the plate-tightening device 03r placed in the front portion and the tightening device 03e placed in the rear portion are received. The tightening device 03r has an upper tooth 05r, a lower tooth 04r, a pin 06r, a tightening cam 07r, and a bolt 08r for fine adjustment. The tightening device 03e has an upper tooth 05e, a lower tooth 04e, a tightening cam 07e, a bolt 08e for fine adjustment, and a plate-stretching cam 09. When the printing plate, indicated by numeral 10, is mounted or removed, wrenches are brought into engagement with wrench attachment portions 12r and 12e on the cam shafts 07r and 07e, respectively, which are mounted at the lateral center of the machine. Then, the wrenches are manually rotated through about 90°.

As mentioned above, it is necessary to manually rotate the cam shafts to mount or remove the printing plate. One printing machine has two wrench attachment portions with which wrenches are brought into engagement. A four-color printing machine has as many as eight wrench attachment portions. In order to manually operate these portions, a considerable number of steps and a long time are required. This lowers the rate of operation of the printing machine. Also, the rear side of the printing plate is required to be tightened simultaneously with the insertion of the rear portion of the plate. This operation needs skillfulness.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an automatic printing press-tightening device which is used with a sheet-fed printing machine and which saves labor, requires no skillful operator, and enhances safety when a printing plate exchange operation is performed.

The above object is achieved in accordance with the teachings of the invention by an automatic printing plate-tightening device for use with a sheet-fed printing machine, said device having a plate cylinder, a cam shaft extending from one side surface of the cylinder, an arm mounted on the cam shaft, a pin mounted at the end of the arm, a first cylinder capable of rotating the arm about the cam shaft, and a second cylinder capable of changing the orientation of the first cylinder. The front end of the first cylinder can engage with the pin. The arm is rotated by the first cylinder to tighten or release a printing plate.

After the completion of the installation of the printing plate, the present tightening device is held at its standby position so as not to hinder the printing operation. This series of operations is electrically controlled in a sequential manner.

When the second location cylidner rotates the first cylinder and the front end of the first cylinder comes into engagement with the pin connected to the cam shaft, the rod of the first cylinder is retracted to tighten the front portion of the printing plate.

Then, the front end of the first cylinder is disengaged from the pin and brought into engagement with another pin connected to a cam shaft extending from the rear portion of the plate cylinder, in order to tighten the rear portion of the plate. When the plate is released from the tightening device, these operations are performed in the order opposite to the foregoing.

Other objects and features of the invention will appear in the course of the description thereof which follows.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a fragmentary side elevation of an automatic printing plate-tightening device according to the invention and for use with a sheet-fed printing machine, and in which the front portion of a printing plate has just started to be tightened;

Fig. 2 is a cross-sectional view taken on line A-A of Fig. 1;

Fig. 3 is a view similar to Fig. 1, but in which the rear portion of the plate has just started to be tightened;

Fig. 4 is a view similar to Fig. 3, but in which the printing plate has been fully tightened and a cylinder for rotating a cam shaft is at its standby position;

Fig. 5 is a fragmentary side elevation of a conventional manual printing plate-tightening device, and in which upper teeth are open;

Fig. 6 is a view similar to Fig. 5, but in which the upper teeth are closed to tighten a printing plate; and

Fig. 7 is a side elevation of portions of the device shown in Figs. 5 and 6.

DETAILED DESCRIPTION OF THE INVENTION

Referring to Figs. 1 - 4, there is shown an automatic printing plate-tightening device according to the invention. A printing plate-tightening cam shaft 1 protrudes from one side of a plate cylinder 21. A front arm 2 is held to the cam shaft 1 by a bolt and a key. A pin 3 is mounted to the front end of the arm 2. Also, another printing plate-tightening cam shaft 4 protrudes from the side surface of the plate cylinder 21. A rear arm 5 is rigidly fixed to the cam shaft 4. A pin 6 is affixed to the end of the arm 5. The closed position of the arm 2 is indicated by I, while the open position is indicated by II. When the arm 2 is placed in position II, the front end of the printing plate is inserted between upper and lower teeth. Then, the arm 2 is returned to position I, thus fully tightening the front portion of the plate.

A cylinder 7 acts to rotate the cam shaft 1, and consists of a hydraulic cylinder having a cylinder rod 8 whose rotation is limited. A metallic fixing member 9 is provided at the front end of the rod 8 to transmit its power to the pin 3. The cylinder 7 is coupled to a bracket 10 by an attachment 11. The bracket 10 serves to hold the cylinder 7, and is designed to be rotatable about a point C on a frame 22 via bearings (not shown).

A locating cylinder 12 rotates the bracket 10 to vary the orientation of the cylinder 7. The front end of the rod of the cylinder 12 is connected to the bracket 10 via a pin 13 (Fig. 2). The rear end of the cylinder 12 is rigidly fixed to the frame 22 via a bracket 14. Thus, the orientation of the cylinder 12 can be switched between position III and position IV, as shown in Fig. 1. The center of rotation C of the cylinder 7 is so set that the front and rear cam shafts can be operated most appropriately by the cylinder 7.

The device constructed as described above operates in the manner described below. Fig. 1 shows the condition in which the present device has just begun to tighten the front portion of the printing plate. When the rod of the cylinder 7 is retracted, the upper tooth of the tightening device corresponding to the tooth 05r shown in Fig. 5 moves away from the opposite upper tooth (the arm 2 is moved into position II). Under this condition, the front portion of the printing plate is inserted into the tightening device. Then the rod of the cylinder 7 is advanced. This brings the arm 2 into position I, thus completing the tightening operation. During this process, the rod of the cylinder 12 is kept retracted, and the cylinder 12 is maintained at position III shown in Fig. 1.

Then, the plate cylinder 21 is made to make an approximately 3/4 revolution in the direction indicated by the arrow so that the plate may be wound on the cylinder 21. The orientation of the cylinder 7 is shifted from position III to IV by the cylinder 12.

Fig. 3 shows the next step in which the present device has just begun to tighten the rear portion of the plate. The rod of the cylinder 7 is retracted as in the previous step to move the upper tooth of the tightening device corresponding to the tooth 05e shown in Fig. 5 away from the opposite tooth. Then, the rear portion of the printing plate is inserted into the tightening device. The rod of the cylinder 7 is advanced. Thus, the tightening operation is completed. During this process, the rod of the cylinder 12 is maintained at its advanced position to hold the cylinder 7 at position IV.

Fig. 4 shows the condition in which both the front portion and the rear portion of the printing plate have been fully tightened. The cylinder 7 is at its standby position so as not to hinder the printing operation.

In order to release the printing plate from the surface of the plate cylinder 21, the foregoing steps are carried out in the reverse order.

A separate device (not shown) is provided to maintain the plate cylinder at rest while the plate is tightened and released.

As described above, the novel printing plate-tightening device for tightening the front and rear portions of the printing plate according to the present invention uses the two hydraulic cylinders. Hence, tightening both portions of the plate can be performed by the single device. In this way, the printing plate exchange operation is automated, thus saving labor. Also, no skillful operator is needed. In addition, the safety of the operation is enhanced. Furthermore, the exchange operation is performed in a shorter time than conventional. Additionally, the novel device has a simple structure and is economical to fabricate.

Claims

1. An automatic printing plate-tightening device for use with a sheet-fed printing machine, said automatic printing plate-tightening device having:

a plate cylinder;

a cam shaft extending from one side surface of the cylinder;

an arm mounted on the cam shaft;

a first cylinder capable of rotating the arm about the cam shaft; and

a second cylinder capable of changing the orientation of the first cylinder, the front end of the first cylinder being detachably engaged with the front end of the arm.

2. An automatic printing plate-tightening device as set forth in claim 1, wherein the second cylinder is connected to the first cylinder in such a way that it can switch the orientation of the first cylinder between first and second positions.

3. An automatic printing plate-tightening device as set forth in claim 1, wherein each of the first and second cylinders consists of a hydraulic cylinder.

Fig.1

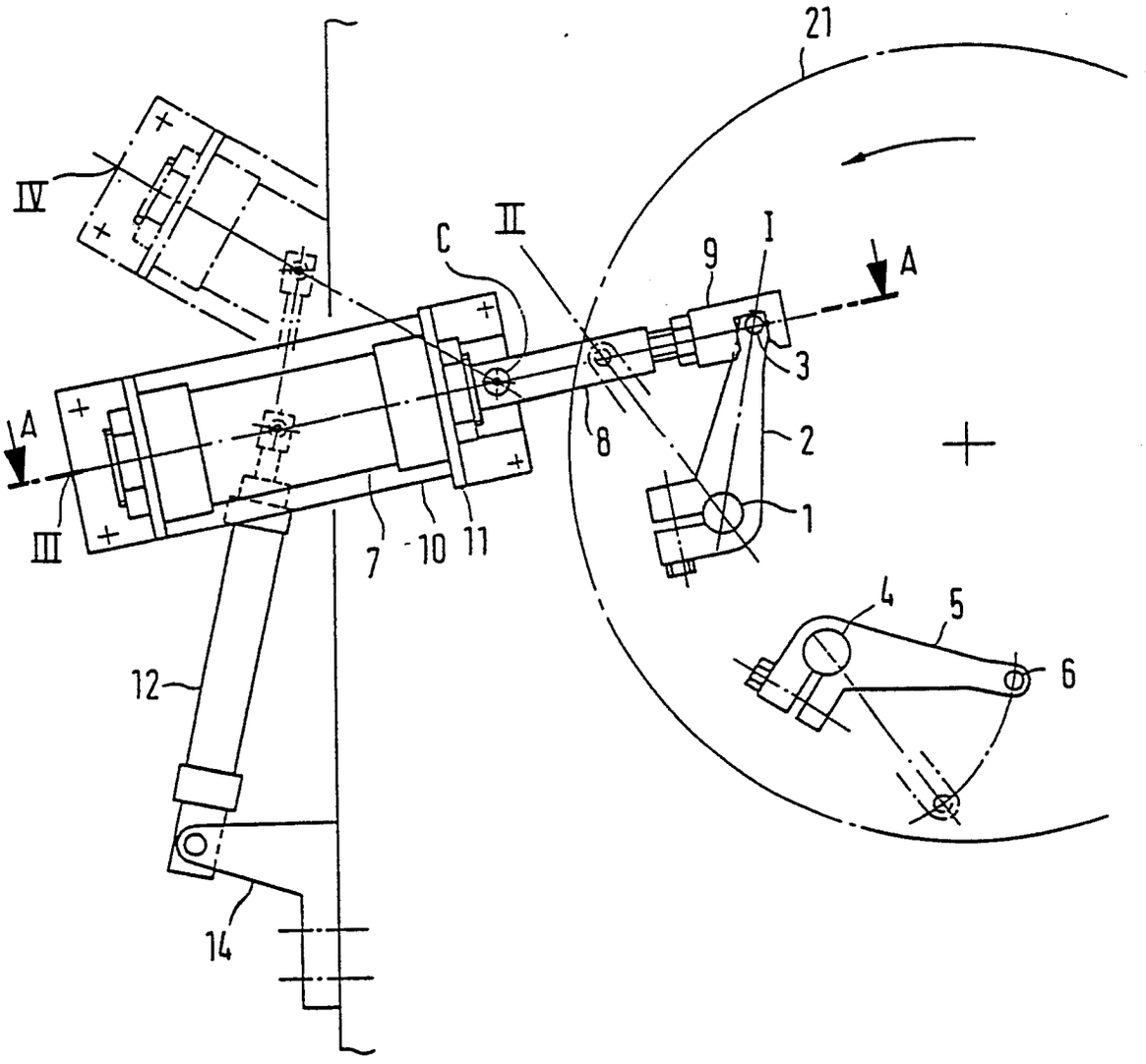


Fig.2

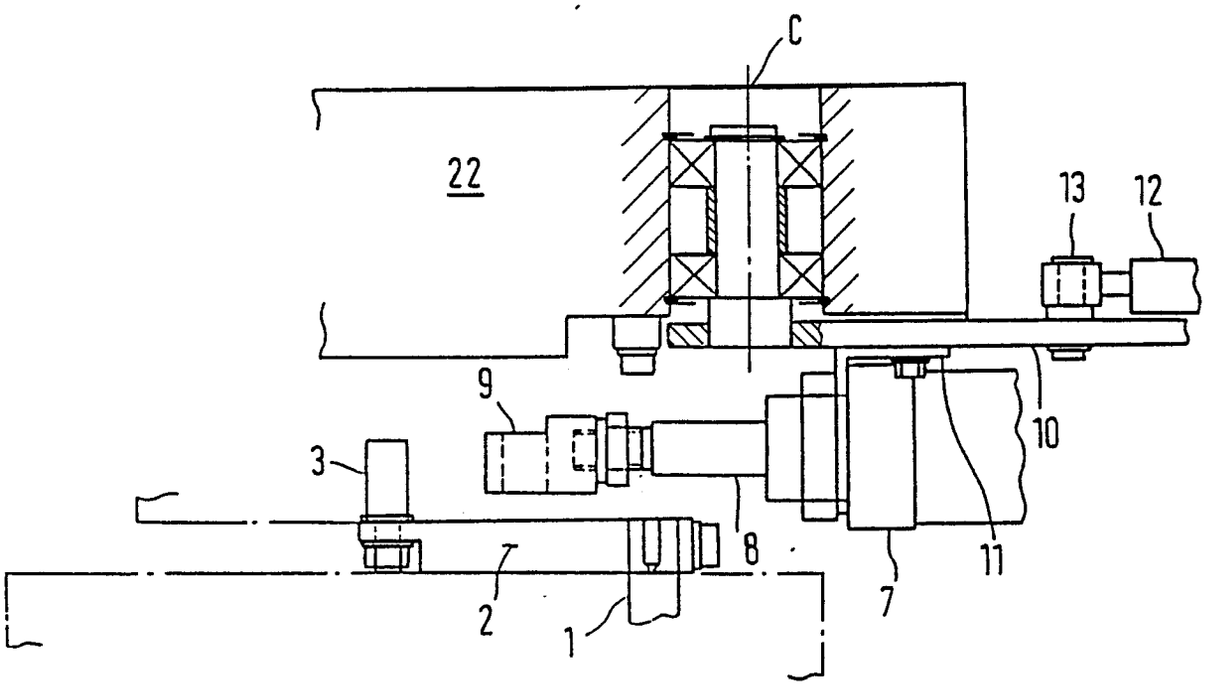


Fig.3

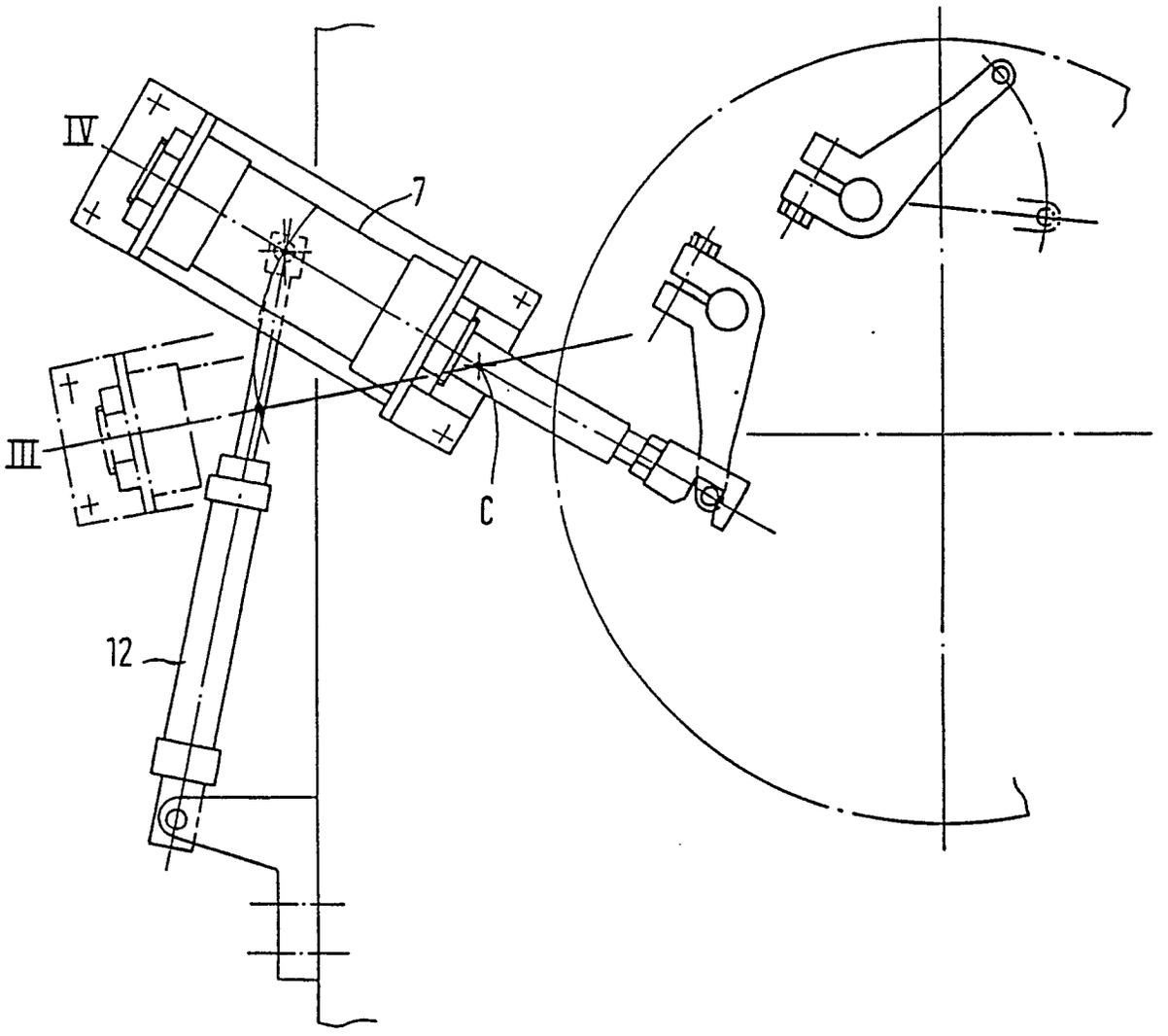


Fig.4

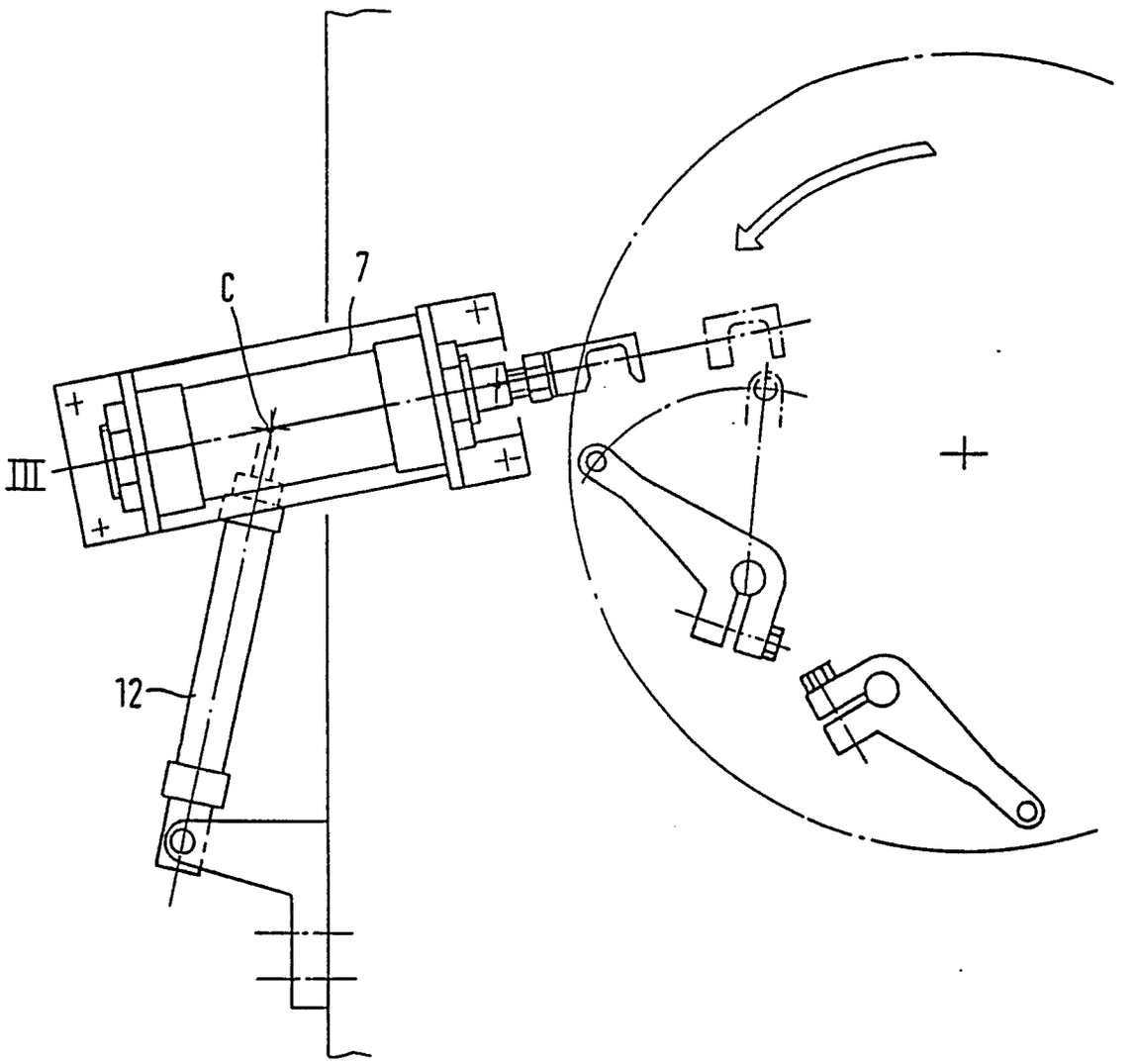


Fig. 5

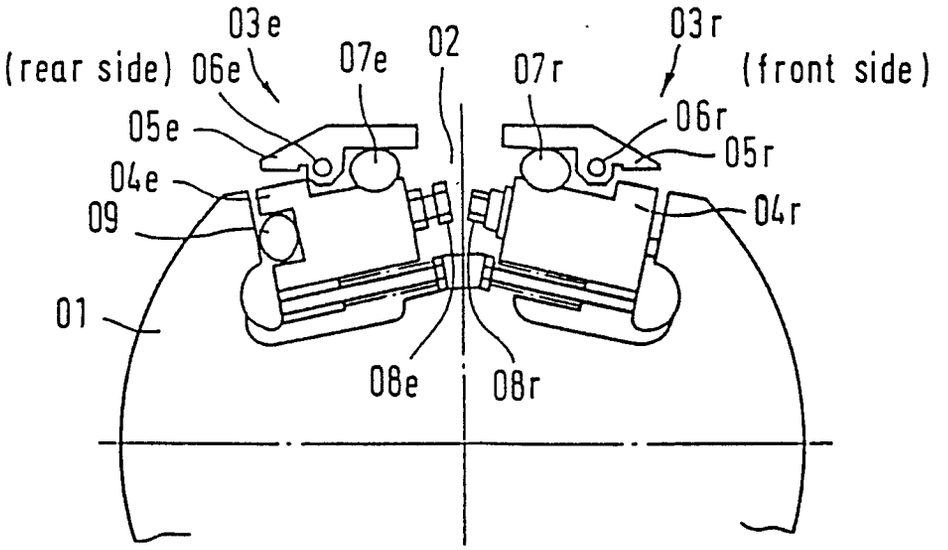

03e
(rear side)
06e
07e
02
07r
03r
(front side)
06r
05e
05r
04e
09
04r
01
08e
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Fig. 6

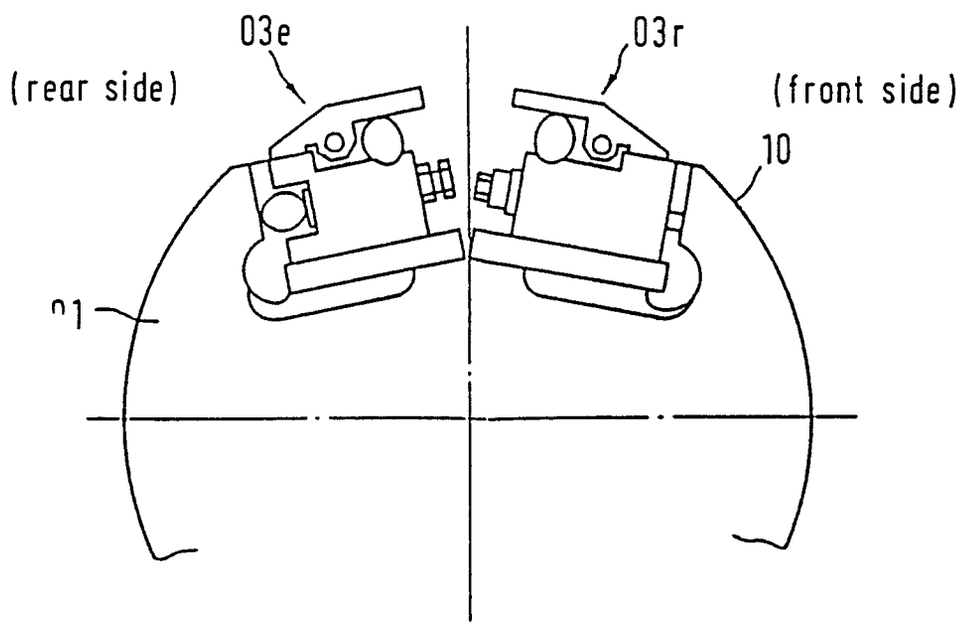
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Fig.7