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(54) Operating device for circuit breakers

Betätigungsvorrichtung für elektrische Schalter

Dispositif d'actionnement pour interrupteurs électriques

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Description**TECHNICAL FIELD**

The present invention relates to an operating device, intended for electric circuit breakers, of the kind described in the preamble to claim 1. The operating device is primarily intended for SF₆ breakers for outdoor substations with a rated voltage of the order of magnitude of 40 kV and higher, but the operating device may advantageously be used also for other types of circuit breakers.

A circuit-breaker operating device of the above-mentioned kind is previously known from DE-C-1 948 405. Such an operating device comprises a very large number of mechanical parts. The device is to combine high reliability with great precision and accuracy of repetition when assembling the various parts included.

The present invention aims to provide an operating device of the above-mentioned kind which fulfils the above-mentioned demands and which, in comparison with corresponding prior art designs, makes possible a simpler assembly, which in turn contributes to reduce the manufacturing cost.

To achieve this aim the invention suggests an operating device for circuit breakers according to the introductory part of claim 1, which is characterized by the features of the characterizing part of claim 1.

Further developments of the invention are characterized by the features of the additional claims.

According to the invention, a cam disc module included in the operating device is built up around a long splined shaft, in which a so-called blind spline is utilized to ensure an accurate mutual angular position between all the driven parts. In the design proposed, all the parts may be mounted on the shaft from one and the same direction, which makes possible bench assembly. The crests of the splines may be utilized as bearing seats for the roller bearings of the shaft. With the aid of a simple check fixture, it may be ensured that all the parts are there and are exactly positioned. A cam disc module of the proposed design fulfils very high demands regarding reliability and precision and can be supplied finished and tested as a spare part.

By way of example, the invention will now be described in greater detail with reference to the accompanying drawings, wherein

Figure 1 shows an embodiment of an operating device according to the invention while the closing springs are being loaded,

Figure 2 is a perspective exploded view of a cam disc module included in the operating device,

Figures 3 and 4 show the cam disc module in an

end view and an axial section, respectively, and

Figure 5 is a perspective view of a latching arm included in the cam disc module.

The operating device shown in Figure 1 is intended for high-voltage circuit breakers of, for example, the kind described in Asea Journal 1983, No. 3, pp. 16-21. The different parts of the operating device, with the exception of the opening spring 28 of the circuit breaker, are enclosed in a cabinet 30. The operating device has an operating shaft 1, on which is mounted a cam disc 7 which, via an operating lever 31 and an operating rod 32, influences the position of the movable contact 33 of the circuit breaker. Closing of the circuit breaker is performed by turning the operating shaft 1 in a clockwise direction, which is achieved with the aid of a number of closing springs 16 in the form of compression springs which are tensioned between an upper fixed spring bridge 17 and a lower vertically displaceable spring bridge 18. The spring tensioning is performed with the aid of a motor which drives a chain wheel 19, which with the aid of a catch is prevented from rotating in the reverse direction. The interconnection of the closing springs 16, the motor-driven chain wheel 19 and the operating shaft 1 is performed with the aid of an endless chain 20, in which the lower spring bridge 18 is suspended from a chain wheel 21. From the wheel 21 the chain 20 passes over a chain wheel 6 fixed to the operating shaft 1 and continues via an idler sprocket 23 and the driving wheel 19, and finally returns to the wheel 21. A stretching chain 24, running over two idler rolls 25 journaled in the bottom of the operating cabinet, is fixed at one end to the shaft of the idler sprocket 23 and at the other end to the lower spring bridge 18. The task of the stretching chain 24 is to keep the endless chain 20 stretched.

A closing latch 26 is arranged near the operating shaft 1, such that the shaft can only rotate one revolution upon each closing operating. Further, a tripping latch 27 is arranged near the operating lever 31 to keep the movable contact of the circuit breaker in the closed position after a closing operation.

As soon as a closing operation has taken place, the motor which drives the chain wheel 19 is automatically started. The chain wheel 6 with the cam disc 7 fixed on the operating shaft 1 stands still, since a latching arm 5 fixed on the shaft 1 is locked against the closing latch 26, whereby the chain section 20b lifts the spring bridge 18. This causes the closing springs 16 to become tensioned again and the operating device again assumes the normal operating position.

If the circuit breaker is already in the closed position, or if the closing springs of the operating device are non-tensioned or not completely tensioned, no closing operation is allowed to be performed. To prevent such un-

justified operation, which, for example, may occur by manually opening the closing latch or if a mechanical fault arises in the locking mechanism, the operating device is provided with an interlocking mechanism which includes an interlock disc 8 (Figures 2-4) mounted on the operating shaft 1.

Figure 2 shows the operating shaft 1 and all the parts intended to be mounted thereon, such as retaining rings 2, cylindrical roller bearings 3, spacers 4, latching arm 5, chain wheel 6, cam disc 7, interlock disc 8, catch flap 9, locking pins 10, springs 11, resilient tubular pin 12, attachment 13 and retaining rings 14.

The operating shaft 1 is provided with longitudinal splines (ridges) 35 (Fig. 3), whereas the latching arm 5, the chain wheel 6, the cam disc 7 and the interlock disc 8 are provided with grooves 37 (Fig. 5) corresponding to the splines. To ensure that the latching arm 5, the cam disc 7 and the interlock disc 8 are mounted in the correct mutual angular position, the shaft 1 is provided with a so-called blind spline 36 (Fig. 3), which is wider than the other splines, whereas the mentioned parts 5, 7 and 8 are provided with a groove 38 (Fig. 5) corresponding to the blind spline. The blind spline 36 may, for example, be achieved by filling the space between two adjacently located splines 35 with material, whereas the groove 38 is achieved by removing the spline between two adjacently located grooves 37.

The assembly of the parts shown in Figure 2 may be performed in a simple manner as bench assembly, since all the parts may be mounted on the shaft 1 from one and the same direction. The crests of the splines 35 are thereby utilized as bearing seats for the four roller bearings 3. The assembly is facilitated by providing the operating shaft 1 with a number of circumferential grooves 39 axially spaced apart from each other.

The invention is not limited to the embodiment shown but may be applied in several different ways within the scope of the claims.

Claims

1. An operating device for circuit breakers comprising an operating shaft (1) which, via a cam disc (7) mounted on the operating shaft, is adapted to influence an operating lever (31) connected to the movable contact (33) of the circuit breaker, a closing spring (16) which exerts a torque on the operating shaft (1), a tensioning member (19) for charging the closing spring, and a latching arm (5) mounted on the operating shaft and adapted to cooperate with a closing latch (26) to keep the closing spring (16) in tensioned condition, **characterized** in that the operating shaft (1) consists of a substantially circular-cylindrical body, the envelope surface of which exhibits axially oriented splines (35), distributed around the circumference of the body and extending in the entire length of the body, one of the splines

(36) being wider than the others, and that the cam disc (7) and the latching arm (5) have hubs provided with axial grooves (37) corresponding to the splines of the shaft, wherein that groove (38) in the cam disc and the latching arm, respectively, which corresponds to the wider spline is placed such that the disc (7) and the arm (5) are fixed in a predetermined mutual angular position on the shaft (1).

2. An operating device according to claim 1, **characterized** in that it is provided with an interlocking mechanism intended to prevent an unintentional closing operation, said mechanism including an interlock disc (8) which is fixed on the operating shaft (1) by means of splines in the same way as the cam disc (7) and the latching arm (5).
3. An operating device according to claim 1 or 2, **characterized** in that the cross section of the wider spline (36) corresponds to the cross section of two adjoined ones of the other splines (35) plus the space therebetween.
4. An operating device according to any of the preceding claims, **characterized** in that the operating shaft is journaled in a number of bearings (3), the crests of the splines (35) being utilized as bearing seats.
5. An operating device according to any of the preceding claims, **characterized** in that the operating shaft (1) is provided with a number of circumferential grooves (39) axially spaced apart from each other.

Patentansprüche

1. Betätigungsvorrichtung für elektrische Schalter mit einer Betätigungswelle (1), die über eine Kurvenscheibe (7), die auf der Betätigungswelle angebracht ist, imstande ist, einen Betätigungshebel (31) zu beeinflussen, der mit dem beweglichen Kontakt (33) des elektrischen Schalters verbunden ist, mit einer Schließfeder (16), welche ein Drehmoment auf die Betätigungswelle (1) ausübt, mit einem Spannglied (19) zum Laden der Schließfeder und mit einem Rastklinkenarm (5), der auf der Betätigungswelle montiert ist und imstande ist, mit einer Schließrastklinke (26) zusammenzuwirken, um die Schließfeder (16) im gespannten Zustand zu halten, **dadurch gekennzeichnet**, daß die Betätigungswelle (1) aus einem im wesentlichen kreiszylindrischen Körper besteht, dessen Mantelfläche axial orientierte Riffel (35) aufweist (genutete Welle), die um den Umfang des Körpers verteilt sind und sich über die ganze Länge des Körpers erstrecken, wobei einer der Riffel (36) breiter als die anderen ist, und daß die Kurvenscheibe (7) und der Rastklinkenarm (5) Naben haben, die mit axialen

Nuten (37) versehen sind, welche den Riffeln auf der Welle entsprechen, wobei diejenige Nut (38) in der Kurvenscheibe beziehungsweise dem Rastklinkenarm, welche dem breiteren Riffel entspricht, so plaziert ist, daß die Scheibe (7) unter Arm (5) in einer bestimmten gegenseitigen Winkellage auf der Welle (1) fixiert sind.

2. Betätigungsvorrichtung nach Anspruch 1, **dadurch gekennzeichnet**, daß sie mit einem Verriegelungsmechanismus versehen ist, der dazu bestimmt ist, einen unbeabsichtigten Schließvorgang zu verhindern, wobei zu dem genannten Mechanismus eine Verriegelungsscheibe (8) gehört, die auf der Betätigungswelle (1) in der gleichen Weise mittels Riffel befestigt ist, wie die Kurvenscheibe (7) und der Rastklinkenarm (5).
3. Betätigungsvorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet**, daß der Querschnitt des breiteren Riffels (36) dem Querschnitt von zwei benachbart liegenden anderen Riffeln (35) plus dem Zwischenraum zwischen diesen entspricht.
4. Betätigungsvorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß die Betätigungswelle in einer Anzahl von Lagern (3) gelagert ist, wobei die Grate der Riffel (35) als Lagersitze dienen.
5. Betätigungsvorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß die Betätigungswelle (1) mit einer Anzahl in Umfangsrichtung verlaufender Nuten (39) versehen ist, die in axialer Richtung voneinander entfernt liegen.

Revendications

1. Dispositif pour faire fonctionner un disjoncteur, comportant un arbre (1) de fonctionnement qui, par l'intermédiaire d'un disque (7) à came monté sur l'arbre de fonctionnement, est adapté de manière à influencer un levier (31) de fonctionnement relié au contact (33) mobile du disjoncteur, un ressort (16) de fermeture qui exerce un couple sur l'arbre (1) de fonctionnement, un élément (19) de mise en tension destiné à mettre en tension le ressort de fermeture, et un bras (5) de verrouillage monté sur l'arbre de fonctionnement et conçu pour coopérer avec un verrou (26) de fermeture pour maintenir le ressort (16) de fermeture à l'état sous tension, caractérisé en ce que l'arbre (1) de fonctionnement est constitué d'un corps sensiblement cylindro-circulaire, dont la surface enveloppe présente des cannelures (35) orientées axialement, réparties autour de la circonférence du corps et s'étendant sur toute la

longueur du corps, l'une des cannelures (36) étant plus large que les autres, et en ce que le disque (7) à came et le bras (5) de verrouillage comportent des moeux prévus avec des rainures (37) axiales correspondant aux cannelures de l'arbre, la rainure (38) dans le disque à came et le bras de verrouillage respectivement, qui correspond à la cannelure la plus large, étant placée de sorte que le disque (7) et le bras (5) sont fixés suivant une position angulaire mutuelle prédéterminée sur l'arbre (1).

2. Dispositif de fonctionnement suivant la revendication 1, caractérisé en ce qu'il est muni d'un mécanisme de verrouillage mutuel destiné à empêcher un fonctionnement de fermeture non intentionnelle, ce mécanisme comportant un disque (8) de verrouillage mutuel qui est fixé sur l'arbre (1) de fonctionnement au moyen de cannelures de la même manière que le disque (7) à came et le bras (5) de verrouillage.
3. Dispositif de fonctionnement suivant la revendication 1 ou 2, caractérisé en ce que la section transversale de la cannelure (36) la plus large correspond à la section transversale de deux cannelures adjacentes parmi les autres cannelures (35) plus l'espace entre elles.
4. Dispositif de fonctionnement suivant l'une quelconque des revendications précédentes, caractérisé en ce que l'arbre de fonctionnement est tourillonné dans un certain nombre de paliers (3), la crête des cannelures (35) étant utilisée comme siège de palier.
5. Dispositif de fonctionnement suivant l'une quelconque des revendications précédentes, caractérisé en ce que l'arbre (1) de fonctionnement est muni d'un certain nombre de rainures (39) circonférentielles axialement à distance les unes des autres.

Fig. 1

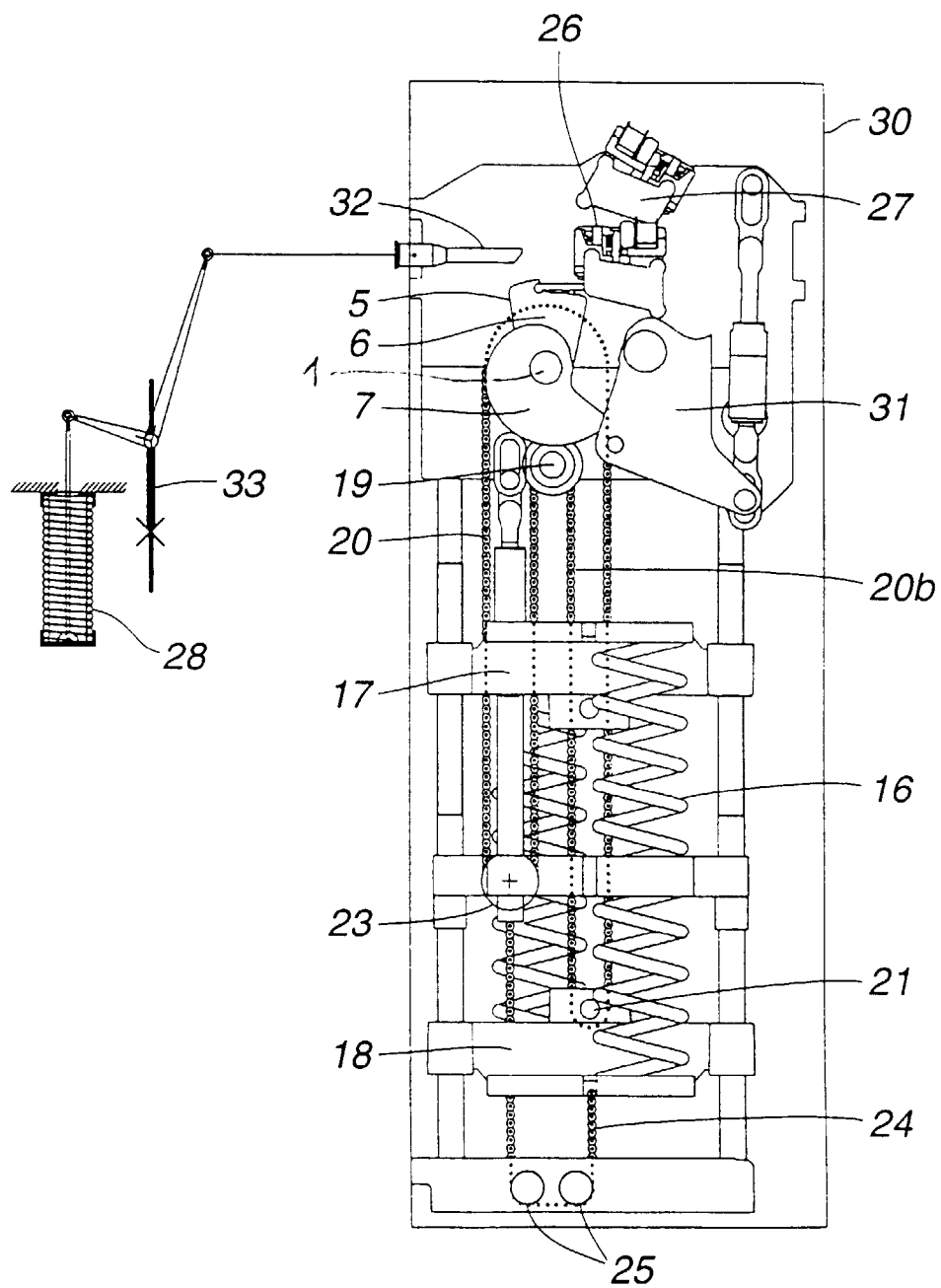


Fig. 2

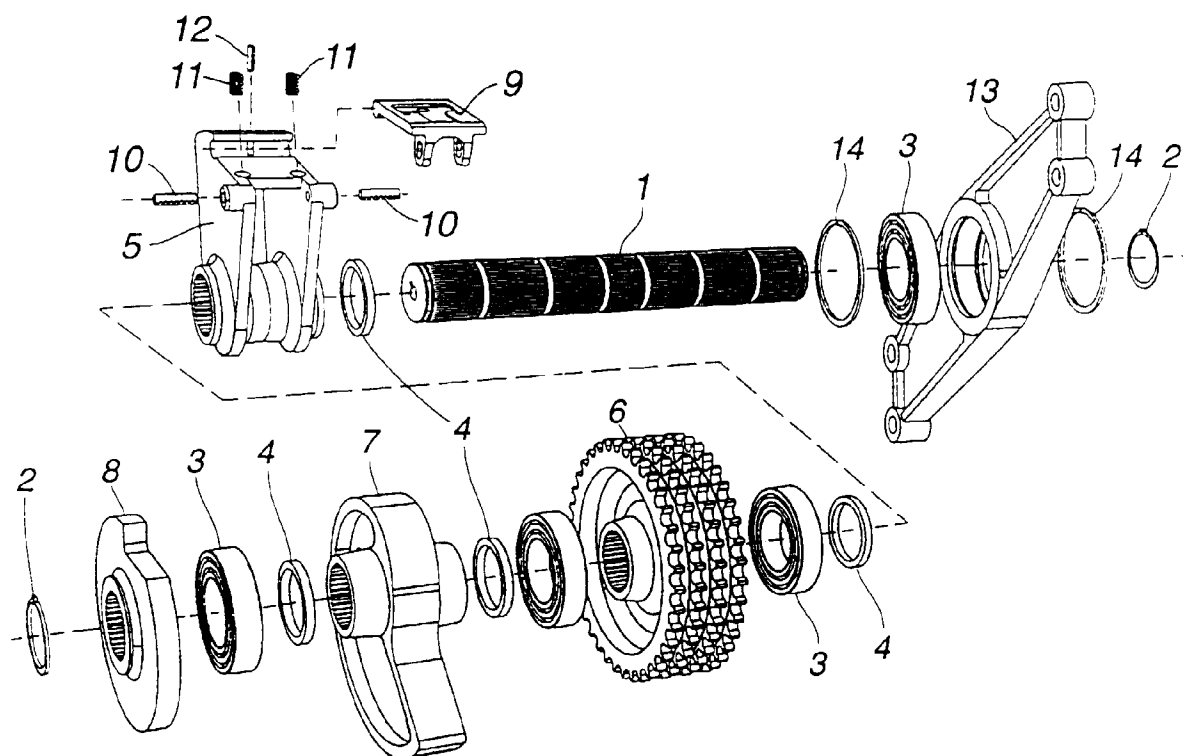


Fig. 5

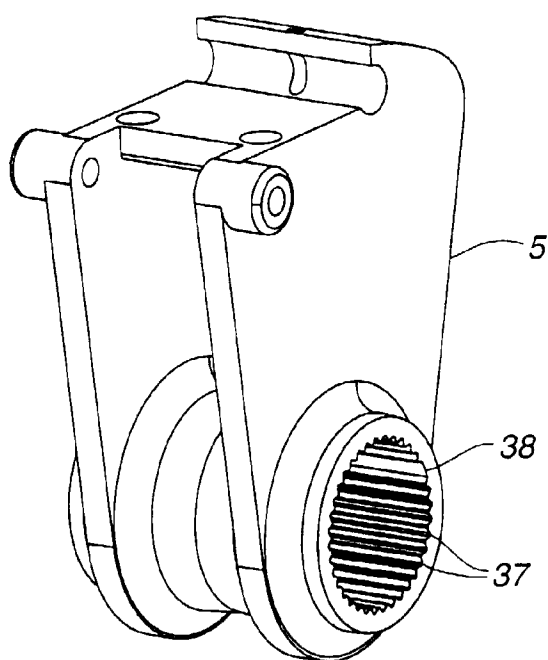


Fig. 3

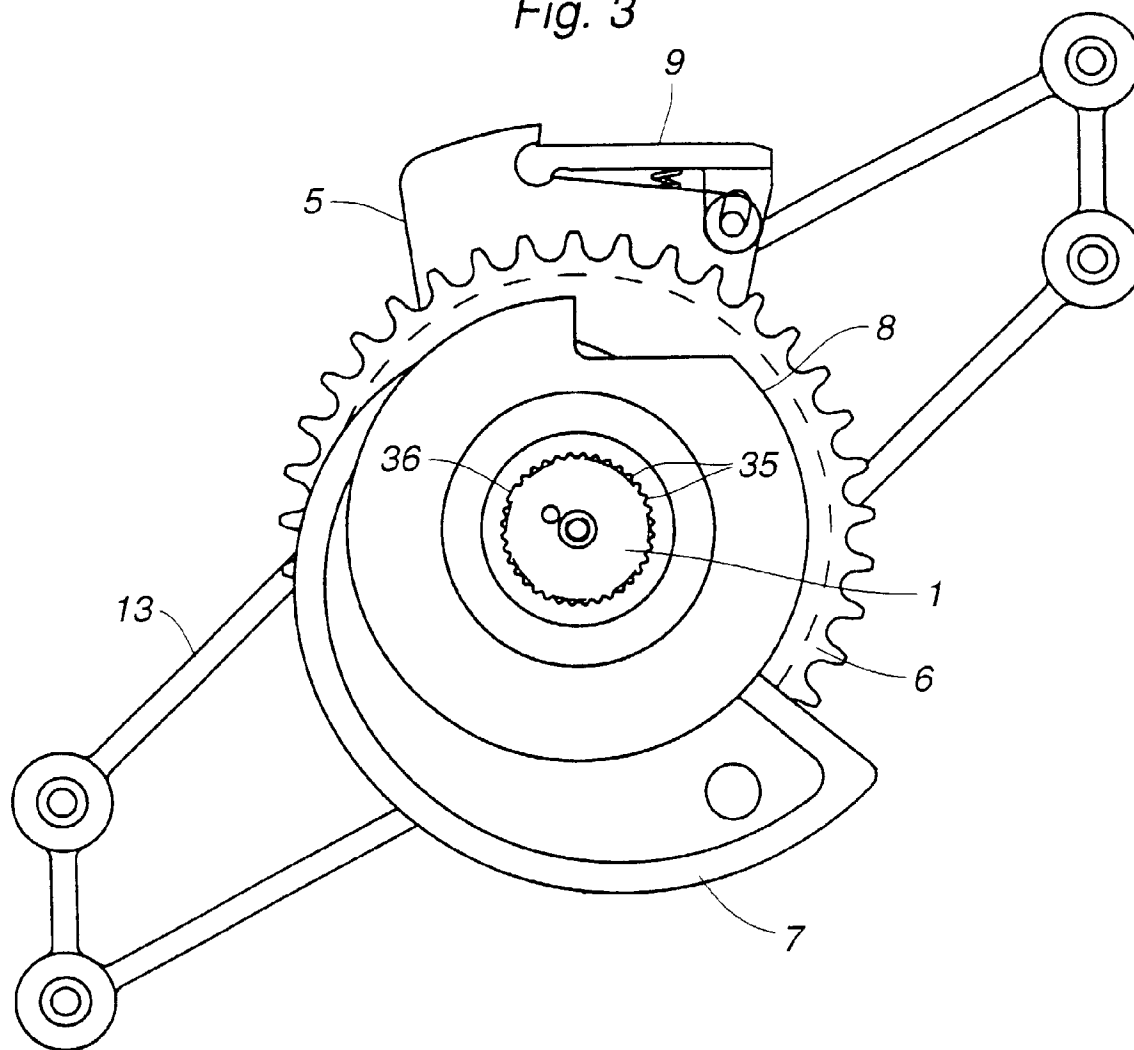


Fig. 4

