July 16, 1929. F. MEYER 1,721,081

REGULATING DEVICE FOR ARC LAMPS

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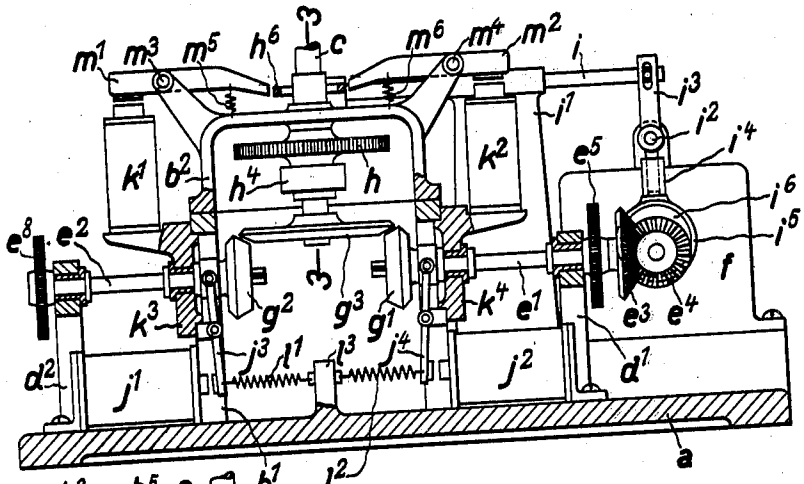


Fig.1

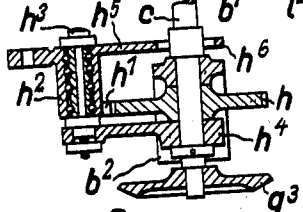


Fig.3

Fig.2

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REGULATING DEVICE FOR ARC LAMPS.

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The present invention relates to a regulating device for arc lamps in which, for producing the regulating motion, one uses a motor which continuously runs in the same direction.

According to the invention a concerted action is brought about by having the motor actuate a shaft, to feed the carbons, (feed shaft), by way of either one of two gears disposed between the motor and the carbons, one a reversing gear and one a disengaging gear the latter rotating the feed shaft at lower speed than the reversing gear, and in addition a number of magnets are provided, two of which,—one being connected with the arc in series, and one parallel to the arc,—actuate the reversing gear, while the remaining ones—which have a greater sensibility than those named in first place—serve for coupling the motor to the feed shaft by way of the second gear.

In this manner one attains a comparatively simplified regulating device by which the carbons are moved,—also for the purpose of ignition,—and in fact are moved quite rapidly. Frequently it will suffice to develop the second gear rotating the feed shaft at lower speed in a manner that it only rotates the feed shaft in one direction, whereby the arrangement would be made in a way as to effect the forward motion of the carbons through the second gear to take place at the moment when the arc-voltage becomes too high, thus compensating the consumption of the carbons. Any excessive intensity of current would then have to be compensated through the motor by way of the reversing gear alone.

If in the described arrangement the motor is coupled to the feed shaft by way of the reversing gear referred to, it will be coupled simultaneously—at least when rotating in the one direction—to the second gear rotating the feed shaft at lower speed. In order to attain thereby the greatest possible simplicity of construction it is suitable to develop the aforesaid disengaging gear into a ratchet gearing, whereupon it is possible to support both gears on one and the same shaft, i. e., either on the feed shaft itself or on a shaft permanently coupled to the feed shaft, since, in driving this shaft by means of the reversing gear, which is invariably effected in the same direction in which the feed-wheel of the ratchet gearing is driven, the wheel can glide away under the pawl.

It will be suitable if the ratchet gear be made double acting, not only to regulate the carbon feeding-process, but also for the purpose of contributing towards regulating the space between the carbons whenever the intensity of current exceeds the normal.

The annexed drawing shows a constructional example of a regulating device with double acting ratchet gear according to the present invention. Fig. 1 of the drawing represents a view partly drawn in section and partly showing the side elevation, while Fig. 2 gives a plan view of the device. Fig. 3 represents a part section of the line 3—3 of Fig. 1.

The device shown has a base plate a upon which is supported a bearing bracket consisting of parts b^1 and b^2. Within the bracket is supported, in vertical position, a shaft c, which is permanently coupled to the carbon feed shaft. Two shafts e^1 and e^2 are supported, in a horizontal position, in part b^1 of the bearing bracket and in two additional brackets d^1 and d^2. One of these two shafts, e^1, is coupled to motor f by a pair of bevel gears e^3 and e^4, while the other shaft, e^2, is coupled to shaft e^1 through two pairs of face gears e^5, e^6 and e^7, e^8. A friction bevel gear g^1 is supported,—capable of displacement in an axial direction,—on shaft e^1 by means of slot and key, and a friction bevel gear g^2 in the same manner on shaft e^2. These two bevel gears together with a bevel gear g^3 fixed to the lower end of shaft c, form a reversing gear. Shaft c furthermore supports a feed wheel h, which stands opposite to a duplex pawl h^1. The pawl, on a ball bearing h^2, is capable of rotating about a bolt h^3 fixed to an arm h^4, which is rotatable in sliding friction about shaft c (cf. Fig. 3).

Pawl h^1 is provided with an arm h^5 having a ring-shaped end h^6 which encircles shaft c. Pawl h^1 furthermore is connected with a rod i, the direction of which is kept straight in bearing bracket i^1, and which is connected with lever i^3 capable of rotating about bolt i^2. Over the lower arm of this lever a sleeve i^4 is slipped capable of sliding back and forth on the lever. Sleeve i^4 is fastened to cam ring i^5 of an eccentric i^6 supported by the shaft of the motor. The device includes two pairs of electro-magnets, i. e., one pair j^1, j^2 fixed to base plate a, and one pair k^1, k^2, the magnets of which are mounted upon two supports k^3 and k^4 of part b^1 of the bearing bracket. The armatures of both magnets j^1 and j^2 are constructed as duplex levers j^3 and j^4 which are rotatably supported at part b^1, one of which, j^3, being pivoted to bevel gear g^2, and the other, j^4, to bevel gear g^1. Tension spring l^1 is connected to the free end of lever j^3, and another tension spring, l^2, to the free end of lever j^4. Both springs are fastened to a nose l^3 of base plate a. So long as magnets j^1 and j^2 are not excited, springs l^1 and l^2 will draw the levers j^3 and j^4 in a position, as shown on drawing, where bevel gears g^1 and g^2 do not engage wheel g^3. The armatures of both magnets k^1 and k^2 consist of two duplex levers m^1 and m^2 rotatably supported on part b^2, the first one, m^1, rotatable about a pin m^3, and the latter, m^2, about a pin m^4. The levers are kept in the position shown on drawing by tension springs m^5 and m^6 so long as magnets k^1 and k^2 are not excited. In this position the free ends of the levers lie next to the ring-shaped end h^6 of lever h^5 thus preventing this lever from backing out sideways when pawl h^1 moves to and fro.

Of the magnets k^1 and j^2 are connected parallel to the arc of the arc lamp, while k^2 and j^1 are connected in series with the arc. Magnets k^1 and k^2 are more sensitive to minor fluctuations in the current flowing through their windings than are magnets j^1 and j^2. It follows, therefore, that it is the first named magnets which are taking care of regulating the fluctuations in the arc-voltage and of the intensity of current and the consumption of the carbons for instance, when the lamp is operated, while the primary task for magnets j^1 and j^2 is, to begin operating at the ignition of the lamp which at times also becomes necessary if the arc is unintentionally broken during the operation of the lamp.

The device shown is operated in the following manner. When switching on the circuit of the arc lamp while carbons are in contact with one another, the current then flowing through the lamp is too strong to begin with. As a result magnets j^1 and k^2 will attract their respective armatures, whereby armature j^3 presses bevel gear g^2 against the wheel g^3, in this way coupling the shaft of the motor f to shaft c which thereby is made to rotate at comparatively high speed in such a manner as to separate the carbons from one another. When the armature m^2 is attracted by magnet k^2, its end, as shown at the left of the drawing, is lifted above the ring-shaped end h^6 of lever h^5. So long as the armature m^2 was not attracted it was not possible for pawl h^1,—which is being moved to and fro through the motor f by way of the eccentric disc i^6 and connecting rod i—, to engage the feed wheel h, as the lever h^5, forming a unit with the pawl, could not back out sideways, and, as the pawl with the arm h^4 invariably had to rotate about shaft c. Now, however, with the armature m^2 standing higher than the lever h^5, the pawl h^1 will rotate in ball bearing h^2, when the connecting rod moves to the left,—since lever h^5, as shown in Fig. 2, can back out to the right—thus enabling the pawl to engage feed wheel h. On the connecting rod i moving farther to the left, the pawl h^1 would revolve the feed wheel h by continuing to rotate with the arm h^4 round shaft c, if the feed wheel were not already revolved by the bevel gear g^3, and, indeed, more quickly than could be effected by the pawl. In this case the feed wheel h glides away under pawl h^1. If in this way the carbons have been separated from one another to a certain distance, the magnet j^1, due to its lesser sensibility, releases its armature for the time being thus disengaging the coupling of the motor to shaft c by way of the reversing gear. The pawl h^1 then begins to work and by degrees keeps on transporting the shaft c still a little farther, in the same direction as wheel g^2, until magnet k^2 releases its armature, m^2, also which latter in turn again prevents the pawl from engaging the feed wheel. If the carbons be too far apart from each other when switching on the current, the magnets k^1 and j^2 will attract their respective armatures, and the operation proceeds in a similar manner as before, only the shaft c being driven in the opposite direction than the previous one.

The regulating motions during the operation of the lamp generally are initiated only by magnets k^1 and k^2 due to the greater sensibility of these magnets. Thereupon, it is solely the ratchet gearing which attends to the rotation of shaft c.

I claim:

1. In a regulating device for arc lamps, the combination of a shaft intended to shift the carbons, a motor running continuously in the same direction, a reversing gear and a disengaging gear, both gears coacting with the motor and the aforesaid shaft and the second gear being adapted to rotate the shaft at lower speed than the reversing gear; a pair of electromagnets, one of them connected in series with the arc of the lamp, and another connected parallel to the arc, both magnets serv-

ing to actuate the reversing gear, another pair of magnets, one in series and the other in parallel with the arc, having a greater sensibility than the two aforementioned ones, and serving to couple the aforesaid shaft to the motor with the aid of the second gear referred to.

2. In a regulating device according to claim 1, the aforesaid second gear being a ratchet gear.

3. In a regulating device according to claim 1, the aforesaid second gear being a ratchet gear suitable for rotating the aforesaid shaft in both directions.

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