April 7, 1936. C. MOORE 2,036,488

VOLTAGE STABILIZER

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Fig. 1

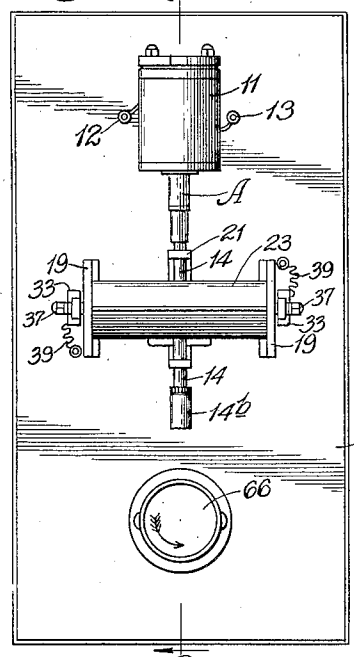


Fig. 4

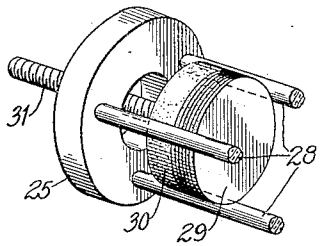


Fig. 5

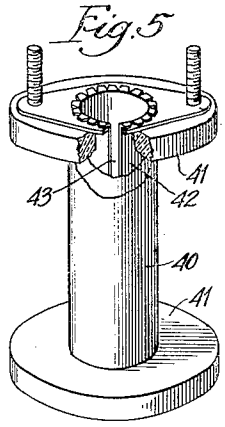


Fig. 3

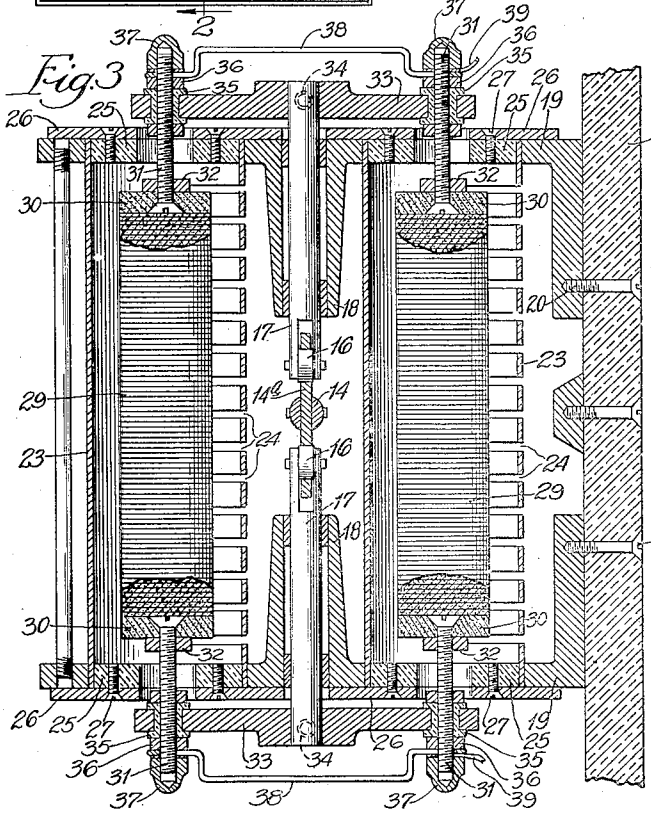
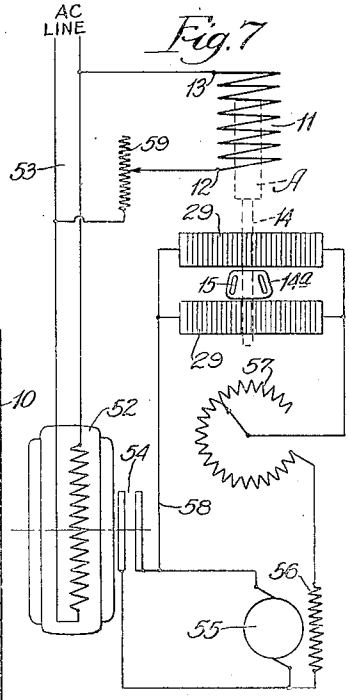


Fig. 7



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Fig. 6

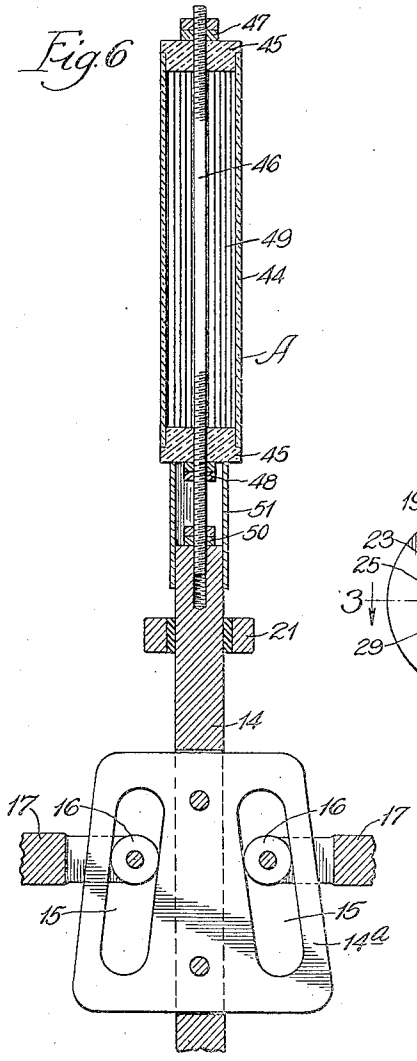


Fig. 2

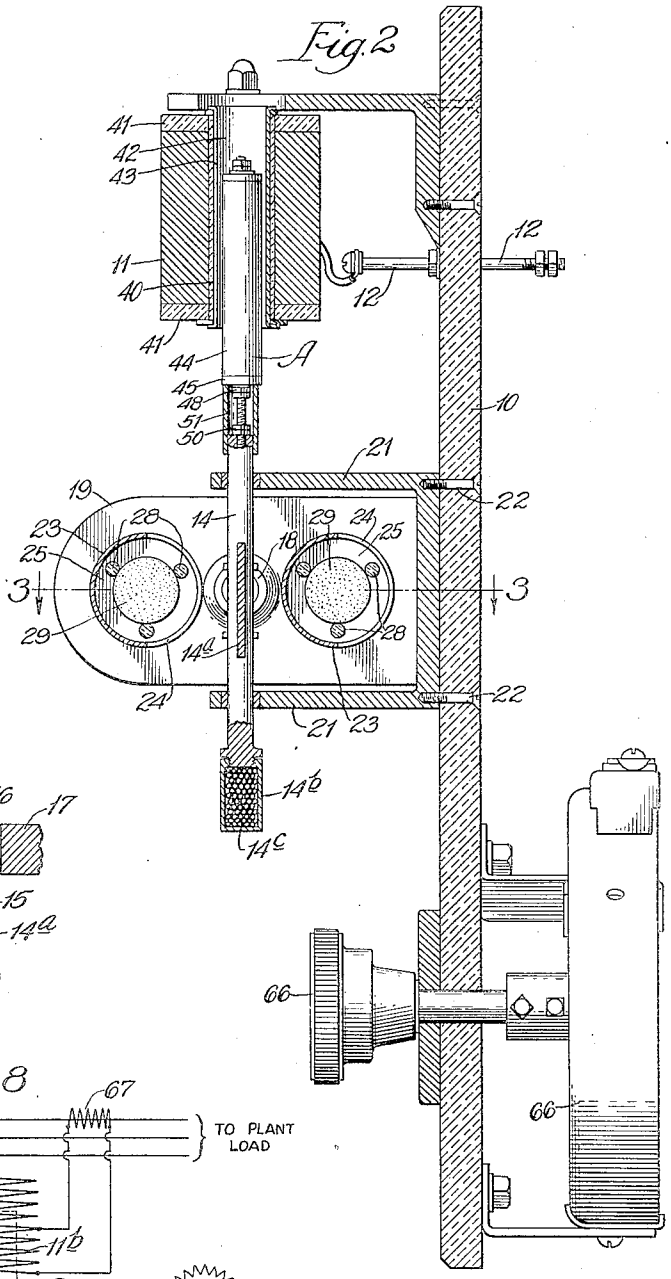
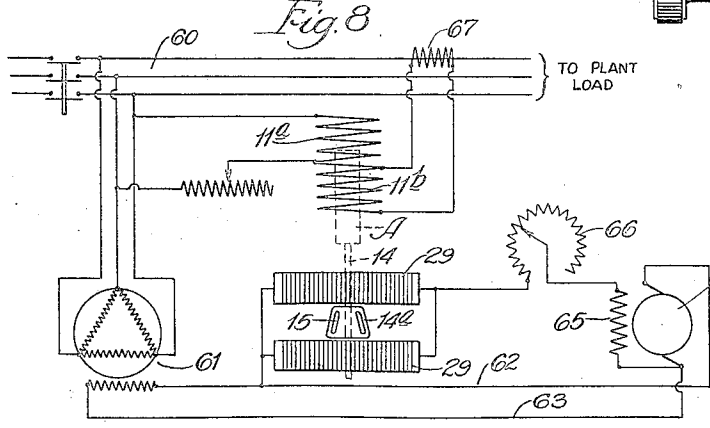


Fig. 8



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2,036,488

VOLTAGE STABILIZER

Clyde Moore, Chicago, Ill.

Application December 30, 1933, Serial No. 704,651

4 Claims. (Cl. 201—51)

This invention relates to a voltage stabilizer for use on both alternating and direct current generators.

An object of this invention is to provide an improved form of voltage stabilizer which will respond more quickly and accurately to changes in line voltage so as to correct for the same.

Another object is to provide such a stabilizer which is simple and positive in action, and which eliminates friction, has no levers, springs, dash pots, and the like, heretofore so commonly used on devices of this kind.

Another object is to provide a means for correcting for plant load power factor.

These and other objects, as will hereinafter appear, are accomplished by this invention which is fully described in the following specification and shown in the accompanying drawings, in which—

Figure 1 is a front elevation of the stabilizer mounted on a panel;

Fig. 2 is an enlarged vertical section on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged horizontal section on the line 3—3 of Fig. 2;

Fig. 4 is a partial perspective showing a detail of the variable resistance element and mounting therefor;

Fig. 5 is a detail in perspective of the spool for the solenoid coil;

Fig. 6 is an enlarged detail of the solenoid core and of the cam carried thereby;

Fig. 7 is a wiring diagram of the voltage stabilizer applied to an alternating current generator; and

Fig. 8 is a wiring diagram of a modification of the device in an alternating current power supply circuit for correcting the power factor.

The device as illustrated in Figs. 1 to 6 inclusive is shown mounted on a suitable insulating panel 10. To this is secured a solenoid coil 11 having terminals 12, 13. Within the coil 11 is a core A which will later be described in detail, and which extends vertically and which has a stem 14 upon which is mounted a cam 14a having cam slots 15 therein in which operate rollers 16 which are rotatably mounted upon the inner ends of rods 17 which lie in the same horizontal plane, and which are slidably mounted in guides 18 which form part of frames 19 which are mounted upon the panel 10 by means of screws 20. The vertically extending stem 14 is slidably mounted in a member 21 so as to be guided thereby, this member being secured to the panel 10 by means of screws 22. The lower end of the stem 14 is provided with a cup 14b which is preferably screwed thereon, and which contains lead shot 14c for adjusting the weight of the stem.

The frames 19 are bored to receive hollow shield members 23. These are partially sawed through to provide slots 24 for the circulation of air around the resistance element, as will presently be explained. Annular disks 25 of a suitable insulating material are fitted in the ends of the shield members 23, and are secured to end plates 26 by means of screws 27, these plates being in turn secured to the frames 19 by screws, not shown. The latter thus hold the shield members 23 in position in the frames. Suitable insulating rods 28, preferably of glass, are fitted into the disks 25, and these are preferably three in number and equally spaced about the carbon disks 29 which go to make up the carbon pile resistances. A carbon disk 30, much heavier than those forming the pile, is placed at each end of the pile and has a screw 31 passing centrally therethrough and secured thereto by means of a nut 32.

A yoke 33 is secured to each of the rods 17 by means of a screw 34 and has an opening at each end through which passes one of the screws 31 which is separated from the yoke by means of a suitable insulation 35, as mica, or the like. The screw is rigidly secured to the yoke by means of suitable nuts 36, while nuts 37 serve to secure the metal connectors 38 and the flexible leads 39.

The spool of the solenoid coil 11 is preferably composed of an insulating tube 40 (Fig. 5) having spool ends 41 also of insulating material, and having a metal lining 42 which is split longitudinally to form a slot 43 so as to avoid eddy currents which would otherwise be produced therein by the alternating field.

The core A (Fig. 6) is preferably made up of a fiber tube 44 with fiber ends 45 held in place by a central screw 46 and lock nuts 47, 48 at its ends. The space is filled with iron wires 49. This screw is screwed into the upper end of the threaded stem 14 and held in adjusted position by means of lock nuts 50. A tube 51 is slidably mounted on the upper end of the stem 14 with enough friction to hold it in place. By lowering this tube the vertical height of the core can be adjusted with respect to the cam 14a and the rods 17. After adjustment the tube 51 is slid up to the position shown.

Thus it will be seen that as current passes through the solenoid coil 11 the core A will be drawn up against the action of gravity, thereby permitting the yokes 33 to move away from the

stem 14 so that pressure on the carbon piles 29 will be relieved. There is a certain amount of springiness in the carbon disks forming these piles, so that as this pressure is relieved the disks tend to separate slightly, thereby increasing the resistance of the carbon pile.

In Fig. 7 an alternating current generator 52 connects into a line 53 and has slip rings 54 connected to a direct current generator or exciter 55. The latter has a shunt field 56 connecting through a variable resistance 57 with carbon piles 29 which are here shown in parallel, the opposite sides of these piles connecting through a lead 58 with one of the slip rings of the generator. The solenoid coil 11 is connected across the line 53 with a variable resistance 59 in series. With the voltage stabilizer connected as shown in Fig. 7 and with the generator in operation, any lowering of the voltage across the line 53 will cause a drop in the core A of the stabilizer, thereby compressing the carbon piles 29, thus causing a flow of more current through the field 56 of the exciter 55. This in turn causes a greater excitation of the generator 52 with a consequent raising of the voltage of the line 53. When used for direct current stabilization, the carbon pile is placed in series with the shunt field of the generator and the solenoid is placed across the line.

In Fig. 8 is shown a wiring diagram for using a modified form of this stabilizer as a power factor corrector. A three-phase alternating current line 60 leads to a plant load, not shown. A synchronous motor 61 is connected through suitable leads to the line 60, the field of the motor being connected through leads 62, 63 with a direct current generator or exciter 64 having a shunt field 65 which connects through a variable resistance 66 and through carbon piles 29. These are constructed and operated as previously described, and have a core A operating in a solenoid coil 11^a which connects across two wires of the motor circuit with a variable resistance in series therewith. A current coil 11^b is connected to a current transformer 67 which is operatively connected in the circuit leading to the plant load. The current coil is preferably weaker than the voltage coil 11^a, and is set to oppose the voltage coil. Thus the action of the core A is controlled by a combination of impulses due to the voltage variations in the line 60, and of the current drawn through this same line.

Thus the relation of the current to the voltage affects the action of the carbon pile 29 (Fig. 8) and causes it to increase or decrease the resistance therein thereby causing less or more current to flow through the field 65 of the exciter, and this in turn causing less or more current to flow through the field of the synchronous motor 61, thereby tending to restore the balance between the current and voltage in the line 60, thus rapidly correcting for variations in the power factor.

While the two carbon piles 29 are shown connected in parallel in Figs. 7 and 8, it will be understood that if desired they may be connected in series.

While I have shown and described but a few embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made which do not depart from the spirit and scope of my invention as disclosed in the appended claims.

I claim:

1. In a device of the class described having two parallel horizontal piles of carbon disks and a frame for supporting the same, a yoke at each end of the piles adapted to bear on the ends thereof, aligned guides for the yokes, weighted cam means extending between the opposed ends of said guides and connected to said yokes for positively moving said yokes in said guides in opposite directions, said cam means being operable in one direction by gravity to normally move said yokes to compress said disks, and a solenoid for moving said cam means and yokes in the opposite direction to relieve pressure of the yokes on the carbon piles.

2. In a device of the class described having two parallel horizontal piles of carbon disks and a frame for supporting the same, a yoke at each end of the piles adapted to bear on the ends thereof, inwardly extending rods carried by the yokes, tubular guides for said rods mounted in said frame with their axes coincident, means for normally applying pressure to said yokes to compress said disks comprising cam means extending between the opposed ends of said guides and connected to said rods for positively moving said rods in said guides in opposite directions, said cam means being operable in one direction by gravity to normally move said yokes to compress said disks, and a solenoid for moving said cam means and yokes in the opposite direction to relieve pressure of the yokes on the carbon piles.

3. In a device of the class described having two parallel horizontal piles of carbon disks and a frame for supporting the same, a yoke at each end of the piles adapted to bear on the ends thereof, inwardly extending rods carried by the yokes, tubular guides for said rods mounted in said frame with their axes coincident, means for normally applying pressure to said yokes to compress said disks comprising a cam extending between the opposed ends of said guides and connected to said rods for positively moving said rods in opposite directions, a stem secured to said cam, means on said stem for the reception of weights to vary the weight of said cam for normal compression of said disks, and a solenoid surrounding a portion of said stem and operable to move said cam and rods in opposition to said weights to relieve pressure of said yokes on said disks.

4. In a device of the class described having a pair of carbon pile rheostats arranged side by side and each compressible and expansible in the direction of its length, common connections from adjacent ends of the two rheostats extending lengthwise between them, a cam to which both connections are joined for positive actuation thereby in opposite directions, a stem between the rheostats joined to the cam and reciprocable in a direction transversely of the rheostats, and a solenoid in operative connection with the stem adapted for imparting endwise movement thereto whereby a like balanced force is transmitted to both rheostats.

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