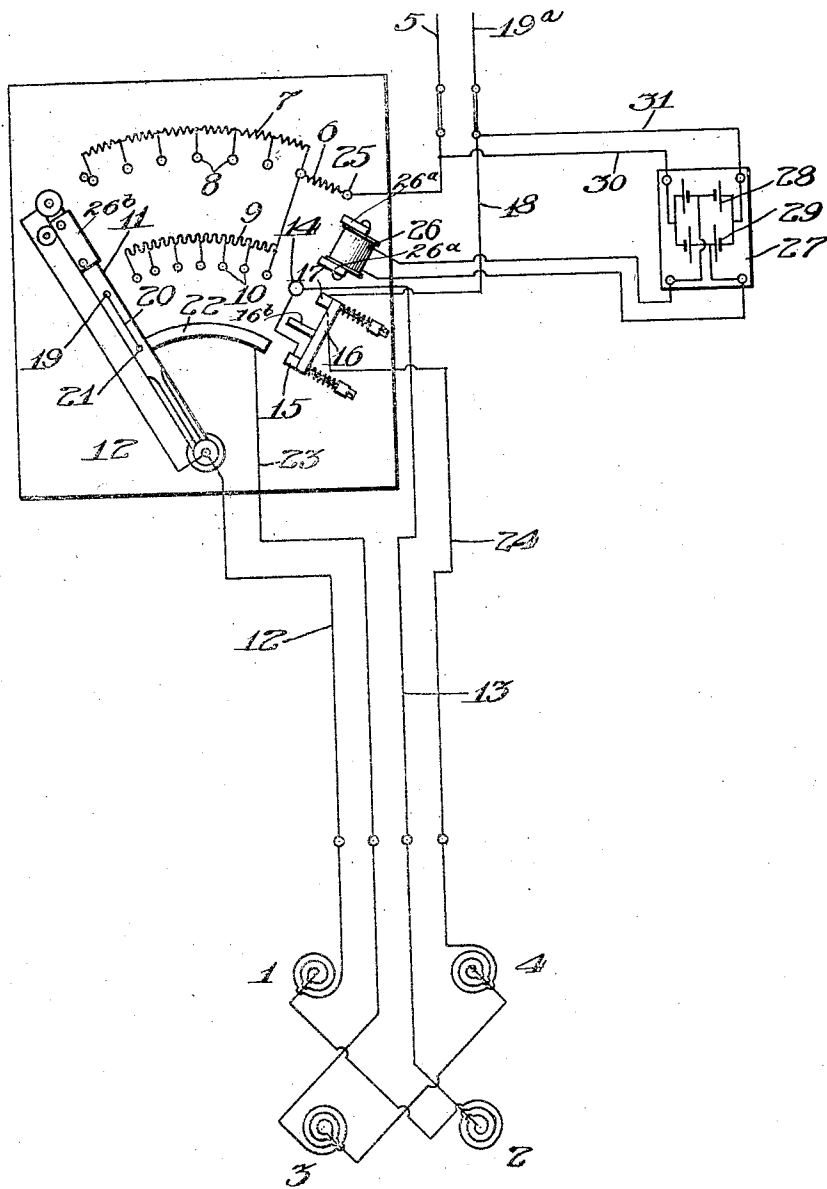


H. H. CUTLER.
 PHASE SPLITTER.
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956,686.

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PHASE-SPLITTER.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HENRY H. CUTLER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Phase-Splitters, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to improvements in means for starting single-phase induction motors, my object being particularly to provide a simple and efficient phase splitter for starting a motor of this character and controlling the same.

In the accompanying drawing I have illustrated diagrammatically one design for carrying out my invention.

I have shown in said figure, diagrammatically, a single phase induction motor, having, say, four field coils, 1, 2, 3 and 4. I have selected this number of coils merely for the purpose of illustration and have not illustrated the rotor or secondary member of the motor, but it will be understood that the usual secondary element of a single phase motor is contemplated. With the supply main 5, a resistance 6 is connected and, likewise, a resistance 7, which is subdivided into a plurality of sections, said sections being connected with terminals or contact buttons 8. A third resistance 9 is also employed and is likewise subdivided into sections which are connected with the terminals or contact buttons 10. One of these resistances, as, for instance, resistance 7, is non-inductive in character, while the resistance 9 is inductive in character. The resistance 6 may be non-inductive and is for the purpose of reducing the potential supplied to the field of the motor at starting.

The contact arm 11 is provided with a contact in the form of a brush connected by conductors 12, 12, through the field windings 1 and 2, thence by conductor 13 to terminals 14 and 15, thence across the bridge 16, to terminal 17, thence by conductor 18 to the opposite side 19^a of the supply circuit. The contact arm 11 carries a brush 19, adapted to sweep over the terminals 10, this contact being connected by conductor 20 with a contact in the form of a brush 21, which is adapted to sweep over the contact bar 22, which bar is connected by con-

ductor 23 through the windings 3 and 4, thence by conductor 24 to conductor 18 and main 19^a. When the contact arm 11 has been moved to the extreme position to the right, the brush thereof engages the terminal 25, the brush 19 engages the terminal 14 and the spring pressed bridge contact 16 is moved out of engagement with the terminals 15 and 17 by means of the contact arm moving against the projection 16^b of said bridge contact. When the contact arm is in its full "on" position it is held by a retaining magnet 26, the armature pieces 26^a of which engage the piece of magnetic material 26^b on the contact arm. The retaining magnet may be supplied with a direct current in any suitable manner. I have illustrated in the drawing one means of supplying this magnet with direct current in the form of a rectifier 27. This rectifier may be of any desired construction, and in the present instance is illustrated diagrammatically as a rectifier of the aluminum iron type, in which the longer transverse lines 28 represent, say, iron, while the shorter lines 29 represent aluminum. The current from the alternating current supply will pass between these metals in one direction only. Accordingly, with the cells disposed as illustrated, a rectified current will be delivered to the retaining magnet 26, said rectifier being connected in the supply circuit 30 and 31, connecting the mains 5 and 19^a with the magnet 26.

The operation of starting the motor is as follows: The parts being initially as shown in the figure, the operator moves the contact arm 11 to the right, accordingly cutting in the resistances 7 and 9 in the field circuits. Circuit is closed from the main 5 through the resistance 6, resistance 7, conductor 12, field windings 1 and 2, conductor 13, terminals 14 and 15, bridge 16, terminal 17, and by conductor 18, to the opposite main 19^a. Also, circuit is closed from the main 5 through the resistance 6, resistance 9, brush 19, conductor 20, brush 21, contact 22, conductor 23, field windings 3 and 4, conductors 24 and 18, to the opposite main 19^a. Since the resistance 7 is non-inductive, while the resistance 9 is inductive, the current passing through the resistance 9 will be retarded in phase, and accordingly, the field windings are subjected to currents of different phase which produce a revolving magnetic field

thereby starting the rotor or secondary member of the motor. As the contact arm is moved to the right to cut out the resistance, the armature accordingly builds up in speed.

While the contact arm is moved over the series of terminals 8 and 10, the fields which are thus connected in two parallel paths are subject to practically one-half of the normal voltage of the supply circuit due to the interposition of the resistance 6. When the contact arm has been moved to the extreme right, that is, to the full "on" position, the bridge 16 is moved out of engagement with the terminals 15 and 17, and the fields are thereby connected in series, the resistance 6 being at the same time removed from circuit so that the full voltage of the supply circuit is imposed upon the circuit containing the field windings. This circuit may be traced from main 5 to terminal 25, thence by conductor 12, through the field windings 1 and 2, conductor 13, terminal 14, brush 19, conductor 20, brush 21, contact 22, conductor 23, field windings 3 and 4, conductors 24 and 18, back to the opposite main 19^a, of the supply circuit. The retaining magnet 26 serves to retain the contact arm 11 in the full "on" position. The connections of the "auto transformer" may be utilized in the well known manner for reducing the pressure at starting. It will thus be seen that the motor is brought to full speed without load and without undue disturbance of the pressure of the distributing circuit.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. The combination with an alternating current motor, of a phase splitter for starting said motor, adapted to connect the field windings of said motor in parallel paths, and comprising a separate resistance for each

of said paths, said resistances being such as to supply said field windings with currents of different phase, a resistance common to each of said first resistances for reducing the voltage of the current supplied to said field windings when connected in parallel, and a single movable member for adjusting said resistances.

2. The combination with an alternating current motor, of a phase splitter for starting the same, adapted to connect the field windings of said motor in two parallel paths, and comprising an adjustable inductive resistance arranged in one of said paths, an adjustable non-inductive resistance arranged in the other of said paths, a third resistance common to both of said paths for decreasing the voltage of the current supplied to said windings when connected in parallel relation and a single movable member for adjusting said resistances.

3. The combination with an alternating current motor, of a phase splitter for starting the same, adapted to connect the field windings of the motor in two parallel paths, and comprising an adjustable inductive resistance arranged in one of said paths, an adjustable non-inductive resistance arranged in the other of said paths, a third resistance common to both of said paths for reducing the voltage of the current supplied to said field windings, and means for removing all of said resistance from the circuit of said field windings and connecting said field windings in series.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

HENRY H. CUTLER.

Witnesses:

F. S. WILHOIT,
T. E. BARNUM.