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APPARATUS FOR PRODUCING ELECTRIC CURRENTS OF HIGH FREQUENCY.

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APPARATUS FOR PRODUCING ELECTRIC CURRENTS OF HIGH FREQUENCY.

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To all whom it may concern:

Be it known that I, NIKOLA TESLA, a citizen of the United States, residing at New
York, in the county and State of New York, 5
have invented certain new and useful Im-
provements in Apparatus for Producing Elec-
tric Currents of High Frequency, of which
the following is a specification, reference be-
ing had to the drawings accompanying and
forming a part of the same:

The apparatus for converting electric cur-
rents of ordinary character into those of high
frequency, which I have heretofore shown
and described in applications for Letters
Patent, has usually comprised a condenser
and a circuit-controller operated by a suit-
able motive device and acting to alternately
charge the condenser from a suitable source
of supply and discharge it through a circuit
of such character as to render the discharge
one of very high frequency. For many
purposes it has been found advantageous
to construct the circuit-controller with in-
sulating and conducting segments of equal
length, so that the condenser is connected
with its discharge-circuit during one-half of
the time only. It follows from this that the
working circuit, or that in which the high-
frequency currents are developed in form for
practical application, receives such currents
during only one-half the time.

For certain purposes it is desirable for
economical operation that there should be no
cessation of the flow of such currents, and my
present improvements have been devised with
the object of increasing the output of a given
apparatus by providing means by which,
without material additions to or complication
of such apparatus, high-frequency currents
may be produced thereby continuously or
without periods of rest.

Broadly stated, the improvement consists
in the combination of two condensers with
a circuit-controller of such character and so
operated by a single motive device as to
charge and discharge said condensers alter-
nately, whereby one will be discharging while
the other is being charged, and conversely.

In the drawings hereto annexed, Figure 1
is a diagrammatic illustration of the arrange-
ment and circuit connections of the inven-
tion. Fig. 2 is a sectional view of a part of
the commutator employed; and Fig. 3 is a
diagram similar to that of Fig. 1, illustrative
of a modified embodiment of the invention.

Let A B designate the two conductors of
any circuit from which the energy is derived
that is to be converted into a current of high
frequency.

C is a circuit controller or commutator, a 60
portion only for convenience being shown in
the figures. It is designed to be rotated by
any suitable motive device, of which, how-
ever, the shaft D only is shown, and its plan
of construction is as follows:

The letters e c′ designate two metal heads
or castings with projecting portions d d′,
which, when the two heads are brought to-
gether and secured to a hub or shaft, inter-
mesh, as shown in the drawings.

The spaces between two adjacent projec-
tions or bars d d′ are equal in arc to the width
of one of said bars and are filled in with blocks
e, preferably of metal, insulated from the other
conducting portions of the device. By the
intersection of mica or other suitable insu-
lating material the two heads or castings c c′
are insulated from each other. Upon the pe-
riphery of this commutator bear three brushes
G G′ H, the two former resting upon the con-
tsiguous metallic portions of the two heads, re-
spectively, the latter being in position to bear
upon the projections d d′ and blocks e alter-
nately.

In order that the brushes may be capable
of carrying any current which the operation
of the apparatus may demand, they are made
of large cross-section, the brush H being ap-
proximately equal in width to one of the pro-
jections or segments d d′, or to the space be-
tween adjacent segments, so that in passing
from one it comes into contact with the next.

The brush H is connected to the main B
through a primary coil K of low self-indu-
cation in inductive relation to a secondary L,
which constitutes the ultimate source of the
current of high frequency which the appar-
atus is designed to develop and which feeds a
circuit containing vacuum-tubes M, single
terminal lamps M′, or other suitable devices.

The brushes G G′ are connected with the main
B through condensers N N′, respectively, and
to the main A through self-induction or chok-
ing coils O O′, these latter being used in order
that the inductive discharge of the accumulated energy therein may be taken advantage of in charging the condensers.

The operation of the apparatus thus described is as follows: By the rotation of the commutator C the brush H is caused to pass over the projections d, closing the circuits through the primary K and the two condensers alternately. These two circuits are so adjusted as to have the same capacity, self-induction, and resistance. When said brush is in electrical connection with any projection d from the part c', the circuit is closed between mains A and B through coil O', brush G', brush H, and coil K. Energy is therefore accumulated in the coil O'. At the same time the condenser N' is short-circuited through the brush G', brush H, and coil K, and discharges through this circuit the energy stored in it, the discharge being in the form of a series of impulses which induce in the secondary L corresponding impulses of high potential. When brush H breaks the circuit through coil O', the high-potential discharge or "kick" from the latter rushes into and recharges the condenser N', but as soon as the brush H has passed over the intervening block e and reached the next segment d it closes the circuit through coil O and short-circuits the condenser N, so that high-frequency currents from either one or the other of the two condensers are flowing through the primary K practically without interruption. Thus without increasing the size or power of the motive device or complicating in any material degree the commutator these devices are made to perform double duty and the output of the apparatus as a whole greatly increased. In Fig. 3 I have illustrated a modified form of commutator for this apparatus, which comprises a disk E, of metal, but insulated from its shaft. The periphery of this disk is divided into conducting and insulated segments by the insertion therein of insulated metal blocks f. The circumferential width of these blocks is three times that of the conducting segments f'. A brush F bears upon a continuous metallic portion of the disk or upon a continuous ring in electrical connection with the segments f' and is connected with one terminal of the primary K. Brushes F' F'' bear upon the periphery of the disk E and are connected to the main B through the two condensers, respectively. These brushes are capable of angular adjustment, so that they may be set to bear upon the disk at any two desired points.

From the explanation of the operation already given it is evident that when the two brushes F' F'' are set so that one leaves a segment f' at the instant that the other comes in contact with a segment f" the effect in charging and discharging the condensers is the same as in the previous instance. The capability of varying the relations of the brushes, however, which this form possesses has the advantage of permitting not only an alternate charging and discharge of the condensers, but their simultaneous charging and discharge in multiple are, whereby the frequency of the current of discharge is reduced. It is also evident that all phase differences in the charging and discharging of the condensers may in like manner be secured and the frequency varied within wide limits. Of course the same motor and circuit-controller might be made to charge more than two condensers in succession and to discharge them in the same order.

What I claim is—

1. The combination with a source of electric energy, of a plurality of condensers and a discharge-circuit therefor, a motive device and a circuit-controller operated thereby and adapted to direct the energy of the source into the condensers and connect them with the discharge-circuit successively and in alternation, as set forth.

2. The combination with a source of electric energy, of a motive device, two condensers, a circuit-controller adapted to direct the energy of the source alternately into the said condensers, and a discharge-circuit through which, by the operation of said circuit-controller one condenser discharges while the other is being charged, as set forth.

Witnesses:

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NIKOLA TESLA.