June 10, 1941. A. LEIFER 2,245,149

CONVERTER

Filed April 20, 1938

Fig. 1

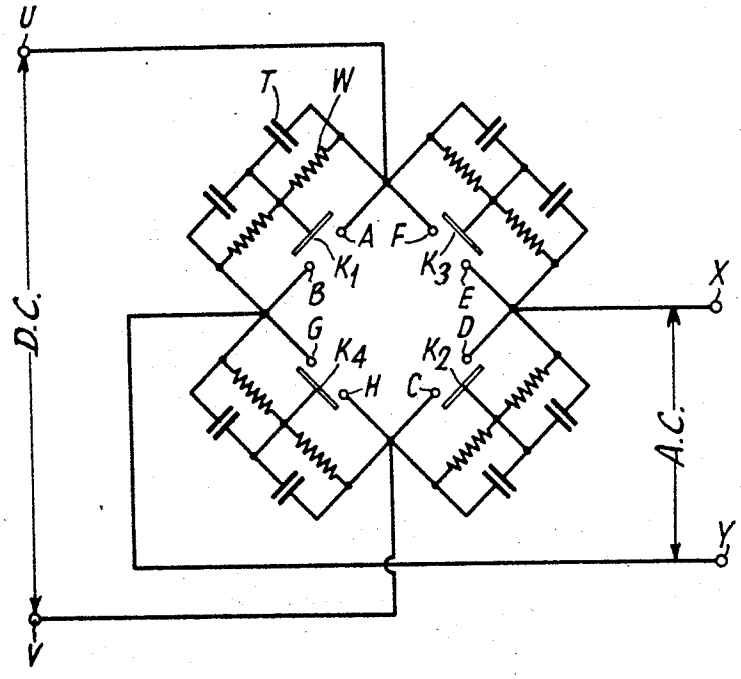
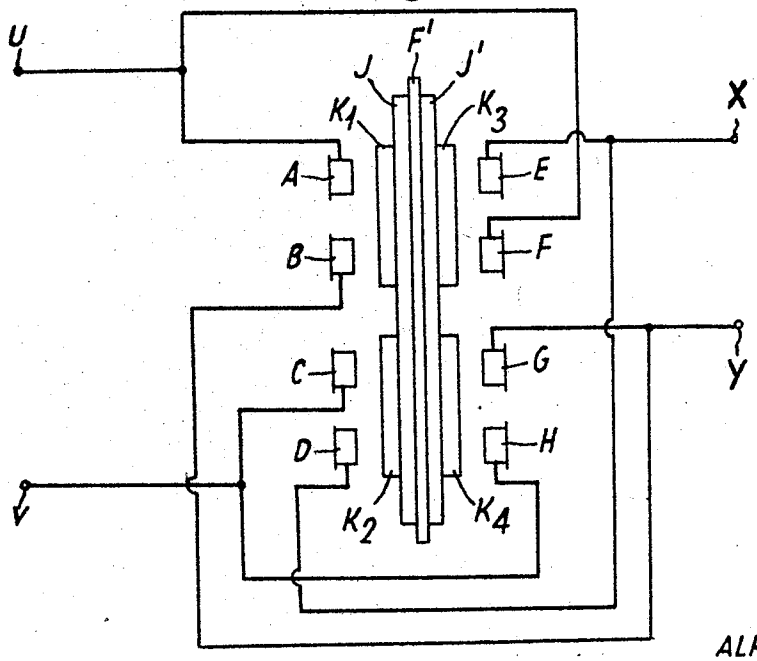


Fig. 2



INVENTOR
ALFRED LEIFER
BY H. S. Sawyer
ATTORNEY

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CONVERTER

Alfred Leifer, Berlin-Karlshorst, Germany, assignor to Telefunken Gesellschaft für Drahtlose Telegraphie m. b. H., Berlin, Germany, a corporation of Germany

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3 Claims. (Cl. 175—365)

In vibrating D. C. converters for higher voltages, for instance, for several hundred volts, and correspondingly larger distances between the contacts, higher separating speeds must be resorted to at the switching-off so as to attain sufficiently short reversing periods and in the main in order to provide a more ready quenching of the sparks. Assuming an economical mass of the vibrating converter, such ends can be attained only to a limited degree since among others the kinetic energy of the vibrating spring increases with the square of its velocity.

In accordance with the present invention at the places at which a single contact was hitherto provided, several contacts are placed in series whose moving contact springs are so arranged and controlled that the opening and closing takes place at the same time on all contacts.

The advantage of the invention resides in that the voltage jump appearing at opening and closing will be distributed approximately with uniformity over the contacts. If the number of contacts placed in series is equal to n, the voltage per contact decreases to the

$$\frac{1}{n}$$

part. This can also be expressed by an increase to the n multiple of the total switching-off speed which is equal to the sum of the individual speeds. The kinetic energy of the entire vibrating spring arrangement hereby increases at the most to n times its value when assuming that the size and the switching-off speed of each of the n springs have remained the same. If the same increased switching-off speed were to be attained with a single contact, the kinetic energy of the spring would increase n^2 times if its mass is the same.

Actually, in the arrangement according to the invention, the conditions are still more favorable, since the n springs could be combined, for instance, to a single large spring whose mass is less than

$$\frac{1}{n}$$

of the mass of the individual spring. Vice versa, when using a single contact and increased switching-off speed also the mass of the spring would have to be increased owing to the increased mechanical stress.

A further advantage of the invention resides in that the voltage at a place of interruption can be maintained below the breakdown voltage for air (300 volt) though the total voltage is much higher.

An example embodying the idea of the invention is shown in the Figures 1 and 2 in connection with a chopper for a vibrating converter for converting D. C. into A. C. Figure 1 shows the circuit diagram. At the terminals U and V, direct voltage is applied to the chopper while at the terminals X and Y an alternating voltage of rectangular curve shape can be derived. The chopper produces in a known manner a double pole reverse switching. During the one phase, the movable contact piece K_1 connects to each other the two stationary contact pieces A and B and thereby also the two terminals U and Y and the movable contact piece K_2 joins the two fixed contact pieces C and D and therewith also the terminals V and X. The closing and opening occurs simultaneously for the four contacts A—K_1, K_1—B, C—K_2, K_2—D connected in series, so that the voltage jump produced will be distributed approximately in uniformity over the four contact paths.

In the next phase, the contact paths remain open while the hitherto opened contact paths E—K_3—F and G—K_4—H will be closed correspondingly whereby U will be connected to X and V to Y.

The manner in which the contacts are arranged is shown in Figure 2. The movable contact pieces K_1, K_2, K_3, K_4 are arranged in pairs on both sides of a vibrating spring F' whereby insulating layers J, J' are interposed respectively. The contacts have a width such that each of them can cooperate with two stationary counter contacts. When the spring swings towards the left, the fixed counter contact pieces A and B are joined by K_1 while C and D are joined by K_2. The contact is made simultaneously at all four contact paths. The corresponding condition exists when the spring swings towards the right. In the center position, the contact plates K_1, K_2, K_3, K_4 are entirely insulated. They do not require a lead-in and the spring F can have any desired potential impressed thereon, it may thus be connected, for instance, to the casing.

It may be possible that at closing of the switch an undesirable deviation from the uniform distribution of the voltage jump may be produced when switching to the four contact paths if the resistances of transition of the four contact paths are different when the switch is open. This disadvantage can be avoided in that as shown in Figure 1 a high ohmic resistor W is

shunted to each individual contact, for instance, to A—K1, which resistor is small as compared with the resistances of transition in the state of opening and which has the same value for all contacts placed in series. Small capacitive irregularities as well as deviations of the spacial arrangement of the contacts placed in series cause irregularities of the distribution of the voltage jump at opening, such condition being avoided by shunting to the individual contacts capacities T having the same value.

It is advisable to arrange the stationary counter contact pieces A—H likewise in a somewhat flexible manner instead of rigid in order to increase the closing periods relative to the opening periods.

I claim:

1. In a vibrator assembly of the type adapted for use in transforming direct current into alternating current, a pair of input terminals arranged to be connected to a source of direct current voltage, a pair of output terminals arranged to be connected to an alternating current utilizing device, a vibrator reed, driving means for said reed, a pair of conducting strips mounted on one side of said reed, a second pair of conducting strips mounted on the opposite side of the reed said strips being insulated from each other and from the reed, a first pair of separate fixed contacts mounted adjacent one of said first pair of conducting strips and positioned relative thereto so that movement of the reed in one direction connects the two contacts together through the strip, a second pair of separate fixed contacts mounted adjacent the other of said first pair of conducting strips and positioned with respect thereto so that the said movement of said reed mentioned above connects the second pair of contacts together through the last named strip, a third pair of separate fixed contacts mounted adjacent one of said second pair of conducting strips and positioned relative thereto so that movement of the reed in the opposite direction to that mentioned previously connects said third pair of contacts together through said last named strip, a fourth pair of separate fixed contacts mounted adjacent the other of said second pair of conducting strips and positioned with respect thereto so that said last named movement of the reed also connects the fourth pair of contacts together through the last named strip, means for connecting one of said first pair and one of said third pair of contacts together and to one of said input terminals, means for connecting said other input terminal to one of the second and one of the fourth pair of contacts, means for connecting one of the output terminals to the other of said second and the other of said third pair of contacts and means for connecting the other of said output terminals to the other of said first and the other of said fourth pair of contacts.

2. An arrangement as described in claim 1 characterized by that a distinct pair of resistors in series is connected between each of said four pairs of contacts and by that the cooperating conducting strip in each instance is conductively connected to a point common to the corresponding series resistors.

3. An arrangement as described in claim 1 wherein a circuit including a pair of substantially equal resistors in series is connected across each of said pairs of contacts each of said circuits being shunted by an additional circuit including a pair of substantially similar condensers in series, the conducting strips associated with each of said sets of contacts being connected to a point intermediate the two associated resistors and also to a point intermediate the two associated condensers of each set of contacts.

ALFRED LEIFER.