

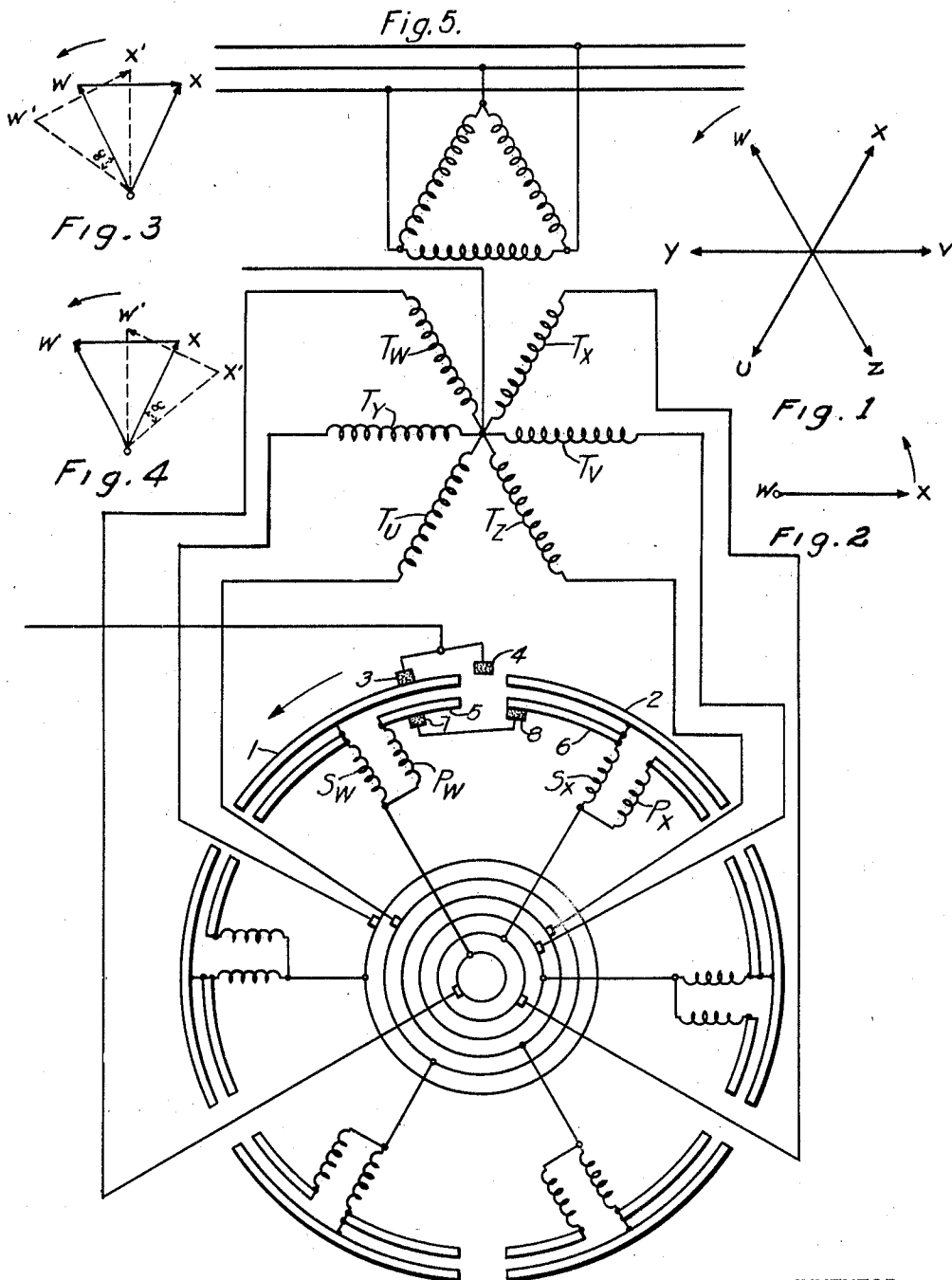
Nov. 10, 1942.

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2,301,752

ARRANGEMENT FOR IMPROVING THE COMMUTATION IN CONTACT CONVERTERS

Filed Sept. 10, 1940



WITNESSES:

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2,301,752

ARRANGEMENT FOR IMPROVING THE COMMUTATION IN CONTACT CONVERTERS

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Application September 10, 1940, Serial No. 356,206
In Germany July 7, 1939

3 Claims. (Cl. 175—364)

This invention relates to a converter and particularly to an arrangement for improving the commutation in contactor converters.

As is well known the commutation is effected in a converter in such a manner that when connecting the next following phase, the phase to be disconnected is still connected in the circuit so that a short circuit is established in which the two phase voltages lie in series. Endeavors have heretofore been made to avoid the sparking which occurs upon the reopening of this internal short-circuit.

The object of the present invention is to provide an arrangement, whereby also the sparking is prevented in a very simple manner when switching in the next following phase. The sparking may be due to two reasons. In the case of very high voltages it may happen that an arcing occurs between the contact pieces shortly before the contact making proper if the contact distance is still very small. The sparking may, however, also be due to the fact that at first only very small portions of the contacts come into engagement so that such a high current density is brought about in the already existing current bridges that an evaporation with subsequent formation of the electric arc occurs. In rotating contact devices having contact brushes and segment edges, whereas the current density in the case of lifting contacts is caused by the fact that the contact surface is by no means smooth, but presents small protuberances which come into engagement with one another.

According to the invention the above-mentioned sparking is avoided by the fact that during the initiation of the commutation, effected by connecting the next following phase, a boosting voltage is superimposed on the voltage of this phase or of the preceding phase, the boosting voltage being substantially equal to the geometrical difference of both phase voltages. The operation of the arrangement according to the invention will be apparent from the following description taken in conjunction with the accompanying drawings, in which:

Figures 1 to 4 are diagrammatic representations of the working potentials in the converter; and

Fig. 5 is a schematic illustration of a converter embodying my invention.

Fig. 1 represents the vector of a six-phase alternating-voltage system. The diagram is based on the assumption that in the case of a perpendicular time vector, the voltages for the phases X and W are of the same magnitude. Owing to

the different positions of phase the variations are also different. The voltage of phase W has the tendency to decrease, whereas that of the phase X increases. A boosting voltage which may also vary sinusoidally and which is represented by the vector WX in Fig. 2 is therefore added to the phase W. In this manner a voltage which when suitably choosing the boosting voltage corresponds to the phase X both as regards magnitude and phase, is obtained as the resultant voltage. As long as this boosting voltage is present the voltage curves of the two phases coincide with each other. Consequently, there results an interval during which there is no potential difference between the two contacts to be connected with each other so that the contacts may be closed without there occurring any sparking. How long this interval is to last depends upon how accurately the beginning of the contact making may be defined. In this connection also the other conditions of commutation play an important part, which must be adhered to in view of a sparkless reopening of the internal short-circuit.

In the same manner as the boosting voltage has been connected in Fig. 3 to the phase to be disconnected, also the boosting voltage may be added to the next following phase. The boosting voltage must then have the opposite position of phase as shown in Fig. 4. The vectors X_1 and W_1 apply both in Fig. 3 and Fig. 4 to a second moment which lags or leads by the angle α with respect to the moment previously considered.

A practical embodiment of the invention is shown in Fig. 5 in diagrammatic form. T_w and T_x denote the secondary windings of the phases W and X of the main supply transformer; in series therewith are arranged the secondary windings S_w and S_x of auxiliary transformers which are to supply the boosting voltage. The current is supplied through contact segments 1 and 2 over which slide the brushes 3 and 4. The brushes 3 and 4 are connected with each other and their distance apart determines together with the insulating space between the contact segments 1 and 2 the length of the time-overlap occurring during the commutation. Besides the segment group to which the segments 1 and 2 belong there is also a further segment group, of which the segments 5 and 6 are shown. This segment group serves to cause the energization of the booster transformer. To this end, the primary winding P_w which belongs to the secondary winding S_w is connected to the segment

5 while the following segment 6 is directly connected to the phase X. Accordingly, also the primary winding P_x of the second booster transformer shown is connected to a contact segment of this group, which segment is in turn followed by a contact segment connected to the adjacent phase. On the auxiliary contact system slide the brushes 7 and 8 which are conductively connected and which have, consequently, the same effect as a single brush whose width corresponds to the greatest distance between the two part brushes. Shortly before the brush 4 comes into engagement with the contact segment 2, i. e., before the short circuit is initiated, the primary winding P_w has as will be apparent, a voltage impressed across it, when the brush 8 slides over the contact segment 6, which voltage is equal to the geometrical difference between the voltage of the phase X and that of the phase W. With a ratio of transmission of 1:1 a voltage of the same magnitude is therefore produced in the secondary winding S_w, which voltage is added to the voltage supplied by the transformer winding T_w and which causes the potential of the brush 4 to be equal to that of the contact segment 2.

What is claimed is:

1. A contactor converter comprising a polyphase alternating-current system, a direct-current system, a contactor device for successively connecting the phases of the polyphase system to the direct-current system, the contacts of the contactor device making contact with the succeeding phase before opening the preceding

phase, and transformer means for impressing a boosting potential between the succeeding and preceding phases substantially equal to the potential difference between the phase potentials.

2. An arrangement as set forth in claim 1, characterized in that the boosting voltage is taken from an auxiliary transformer connected to the phase in question, the auxiliary transformer being energized by an auxiliary switching device shortly before the commutation begins.

3. An electric converter for transferring electric energy between dissimilar electric circuits comprising a polyphase transformer, a main commutator having successive segments connected to successive phase terminals of said transformer, a contact engaging said commutator, said contact being wide enough to make contact with the succeeding segment before opening contact with the preceding segment, an auxiliary commutator having two segments for each segment of said main commutator, there being a leading and a trailing auxiliary segment for each main segment, said leading segment being connected to the associated main segment, a booster transformer connected in series with each phase terminal of the polyphase transformer, said booster transformer having primary and secondary windings connected respectively, to the associated trailing and leading auxiliary commutator segments, and brush means for connecting the trailing preceding segment to the leading succeeding segment at the instant of commutation of the respective main segments.

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