

THE DOUBLE-ENGINE CASCADE ELECTRIC DRIVE

V.N. Meshcheryakov, S.S. Korneev

Lipetsk State Technical University

Represented by a member of Editorial Board Professor V.F. Kalinin

Key words and phrases: inverter stage; slip; energy; EMF; speed pressure (voltage, stress); rectifier.

Abstract: The double electric motor is widely used in the crane mechanisms but there are some difficulties. Since the inequality of the engine's speeds mechanical fluctuations emerge in the steelwork of mechanisms, the electromagnetic modes of both currents of electric motors grow too.

The structural scheme of the double-engine inverter-cascade electric motor has been worked out.

The model of this electric drive has been worked out and the experiment research has been produced. It is possible to use the system of double engine cascade electric drive in the industrial mechanisms, where the synchronic work of the electric motor is required.

The double electric motor is widely used in the crane mechanisms but there are some difficulties. Since the inequality of the engine's speeds mechanical fluctuations emerge in the steelwork of mechanisms, the electromagnetic modes of both currents of electric motors grow too.

The structural scheme of the double-engine inverter-cascade electric motor has been worked out. The principle of the developed system is based on introduction of EMF to the electrical circuit rotor of every electric motor, which depends on the speed of the other engine. It leads to the redistribution of the equivalent EMF introduced to the electrical rotor of every engine and it is accompanied by the change of their dynamic and static characteristics.

If the speed and slipping of the engines are the same the EMF of rotors are the same too. In the process of speeding up of the electric motors the change of the slipping S arises that is why the support of the rectifier current arena changes. It is necessary to requital the output voltage of the rectifier δ . The windings of stators and rotors of the engines 1 and 2 with the help of constant current ad connected with the common electric circuit, the currents in the windings of stator and rotors of the both engines are the same too. The energy of the electric motors slipping is transmitted from the electrical circuits of there rotors to the windings of their stators.

The model of this electric drive has been worked out and the experiment research has been produced.

The results of the research are depicted on the Fig. 1-7. The synchronisation of the speeds remains unchanged in the different conditions.

It is possible to use the system of double engine cascade electric drive in the industrial mechanisms, where the synchronic work of the electric motor is required.

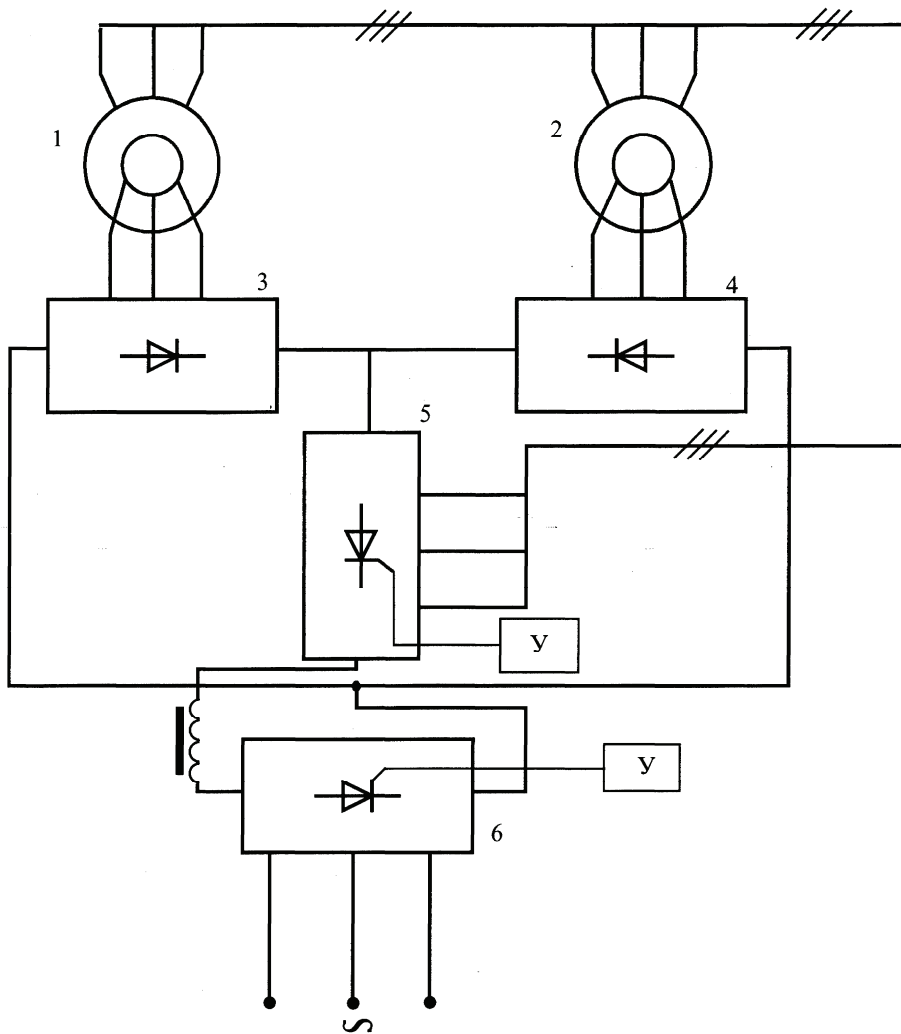


Fig. 1 The electric scheme of the double-engine frequency-cascade electric drive:
 1, 2 – asynchronous electric motors; 3, 4 – non-adjustable rectifier circuit;
 5 – adjustable inverter; 6 – adjustable circuit

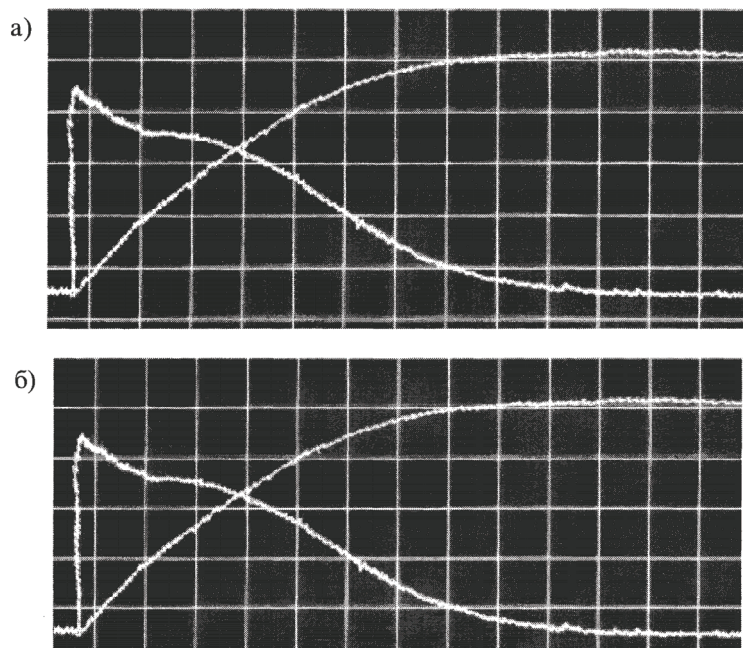


Fig. 2 The diagrams of start moment and the speed of the double-engine of electric driver, the loads are the same:
a – the first electric motor; *b* – the second electric motor

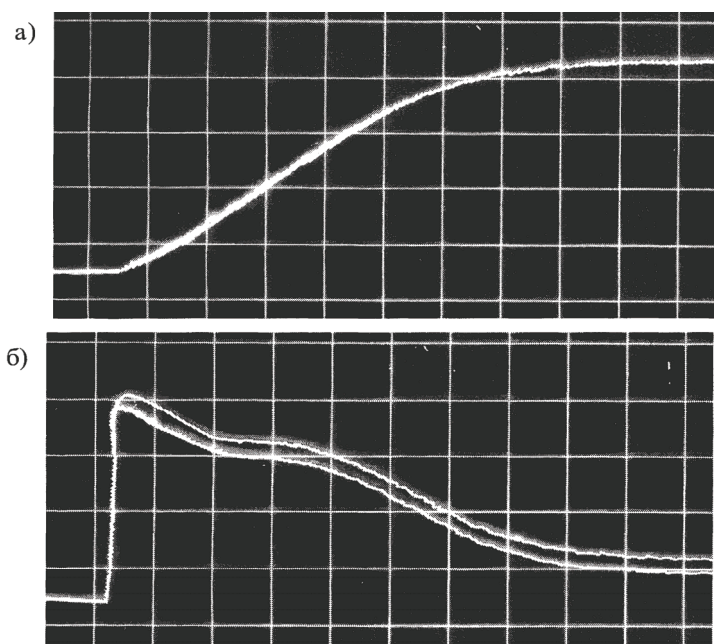


Fig. 3 The diagrams of start of double-engine of electric drive, where the loads are not the same:
a – the speed of the electric motors; *b* – the moments motors of the electric motors

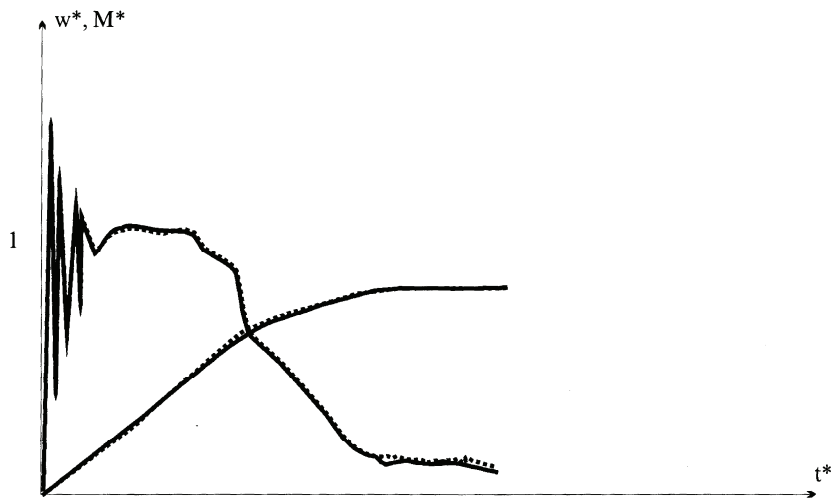


Fig. 4 Start of the double-engine of electric drive, where the loads are same

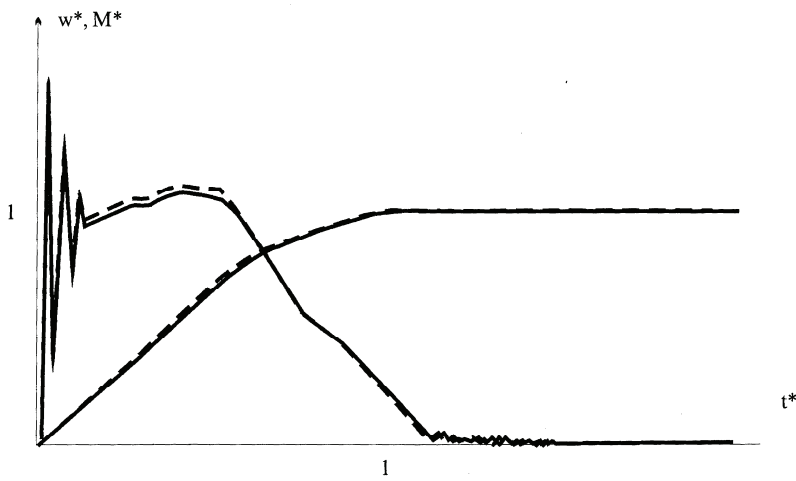


Fig 5 Start of the double engine of electric drive without Soads, where the moment of electric motors inertia grows

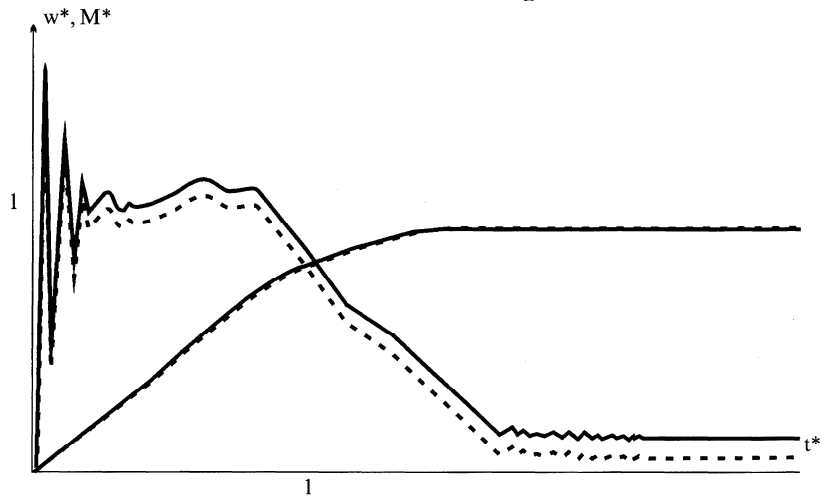


Fig. 6 Start of the double-engine of electric drive where the loads are not the same

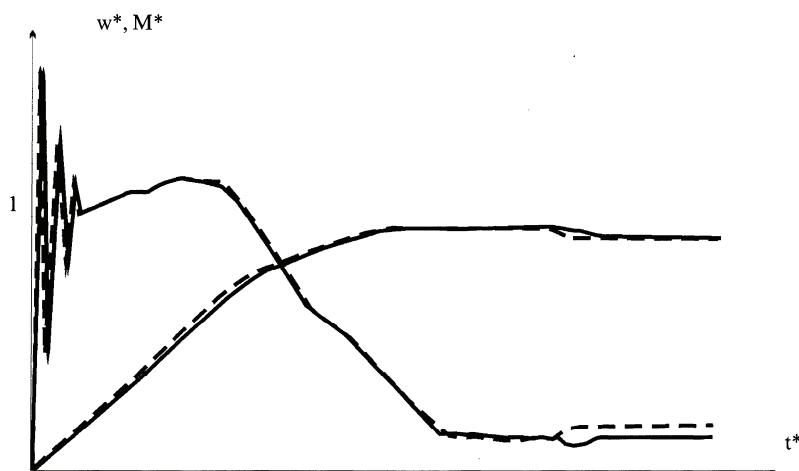


Fig. 7 Start of the double-engine of electric drive where the loads are the same with the following increasing of the load on the electric motor

Двухдвигательный каскадный электропривод

В.Н. Мещеряков, С.С. Корнеев

Липецкий государственный технический университет

Ключевые слова и фразы: инверторный каскад; скольжение; энергия; ЭДС; скорость; выпрямитель.

Аннотация: В крановых механизмах широко используется двухдвигательный электропривод, но при этом возникают трудности. Из-за неравенства скоростей двигателей возникают механические колебания в металлоконструкциях механизмов, при этом электромагнитные колебания токов обоих двигателей тоже существенно возрастают. Разработана структурная схема двухдвигательного инверторно-каскадного электропривода. Составлена модель данного электропривода и проведены экспериментальные исследования. Систему двухдвигательного каскадного электропривода возможно использовать в общепромышленных механизмах, где требуется синхронная работа электродвигателей.

Doppelbetrieblicher kaskadischer elektrischer Antrieb

Zusammensetzung: Es ist das Strukturschema des doppelbetrieblichen wechselrichtlich-kaskadischen Antriebs ausgearbeitet. Es sind das Modell dieses elektrischen Antriebs zusammengestellt und experimentelle Untersuchungen durchgeführt. Das System des doppelbetrieblichen kaskadischen elektrischen Antriebs kann man in gesamtindustriellen Mechanismen anwenden, wo die synchrone Arbeit der elektrischen Antriebe gefordert ist.

Transmission électrique à deux moteurs

Résumé: On a élaboré le schéma de la transmission électrique convertisseur en cascade à deux moteurs. On a fait le modèle de cette transmission électrique et l'on a effectué les études expérimentales. Le système de la transmission électrique en cascade peut être utilisé dans les mécanismes industriels qui nécessitent le fonctionnement synchrone des transmissions électriques.