FUNDAMENTALS AND DESIGN OF THE MECHANICAL WALKER WITH MECHANICALLY ESTABLISHED WALKING AND STANDING BALANCING ALGORYTHMUS

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The curved sliding mechanism OABC, with special parameters, extended with dyad CC′and DC′is the fundamental mechanism of the model of the mechanical walker (Fig.1).

Since the point A of a crank OA of the leading link, has a circular trajectory S_A, the point C of the link AC, of the leaded member moves over the trajectory S_C, the simetrical 6the order curve (1)which special characteristics are of interest for application.

By transforming of the curved sliding mechanism on the equivalent four bar linkage /2/ it is possible to sinthetize the six member joint mechanism. One of the members has the curve translation law of motion, which can be described by the law of motion of the point C of link of the curved sliding mechanism /3,4/. Because the link and moving link of the equivalent four bar linkage are infinite, it′s practical application is inconvenient. This fact improves the use of the quasi equivalent joint four bar linkage with the members of finite length. The law of motion of the point C of the quasi equivalent mechanism is close to the law of motion of the point C of the link of the curved sliding mechanisms/4/.

By appying the Roberts-Čebišev theorem on the quasi equivalent joint four bar linkage it is possible to obtain the parameters of the added dyad, in which one of the members does the curve translation /3,4/.

By the invention of curves sliding mechanism extended with the dyad, whose one mem ber do the close to translation,it is possible to treat it as an four bar linkage CADC′with the added link IB and slider B (Fig. 2).

Two of such identical six mem ber mechanisms, placed in two parallel planes, with the common crank phasic shifted for 180^0, able to rotate around the point C,formes the fundamental structure of the mechanical walker (Fig.3).
The mem bers CC′, the foots, has the floor contact with the unmoving ground, one after the other. The trajectory S_{Oh} of the translatory moving couple of the walker is to be obtained by assembling of the upper parts of the trajectory S_B, from a to b (Fig. 2)., that is from a_1 to b_1 in an continual curve in the sagital plane (Fig.4).

The mechanical walker, sinthetized by the use of mentioned method, does not imitate the human pattern of walking. The conditions necessary for motion stability are based on the explaned mechanical structure. Because of the low walking speed of the walker, the statical stability is of the main interest, the dynamical influence of the instability is of the second order /5/.

By analysing of the human walk /6/ it could be concluded that the head and shoulders are moving approximately uniform, with a constant velocity during walk cycle (Fig.5). Comparing the trajectorys of the mechanical walker (Fig.2) and man´s head (Fig. 5) it is to be pointed out that it is necessary in first approximation to built in the horizontal moving component to the point of the seat (predicted for the handicapped person) OB, for obtaining close to constant velocity during walking.

This is possible to realize by an harmonical mechanism (Fig. 6), with the initiating angular velocity ω_1 , doubled to the angular rate of the fundamental mechanism, $\omega_1 = -2\omega$ The law of motion of the point B is presented at the Fig.6.

By superposition of the motion laws, of the fundamental mechanism (Fig.2) and the harmonical one (Fig.6) results that the moving of the seat of the walker is obtained with the close to constant velocity (Fig.7).

In further establishment it is possible to develope new mechanisms, function generators, which will take in account horizontal component, as well as the vertical one. It is of interest to correct the vertical component of the velocity of the seat of the mechanical walker. The goal for these correction is to obtain better coincidence of the motion laws of the walker to the walking patterns described in gate analysis (6).

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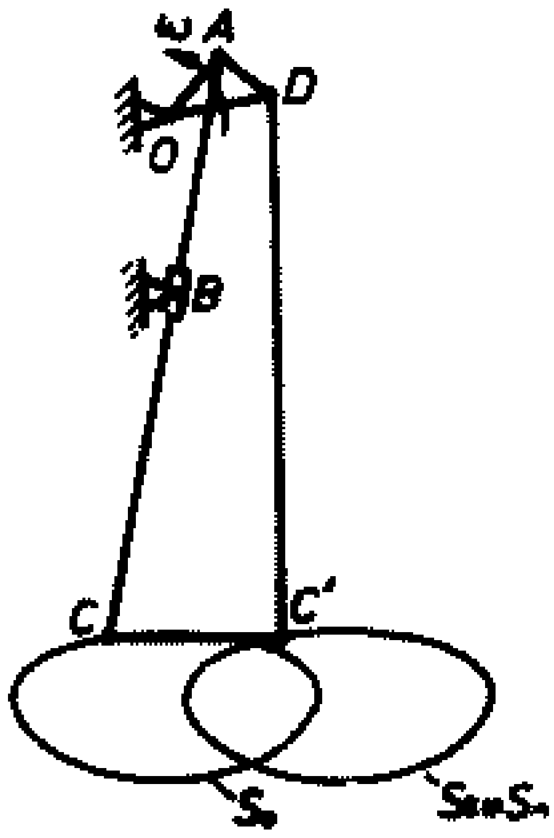

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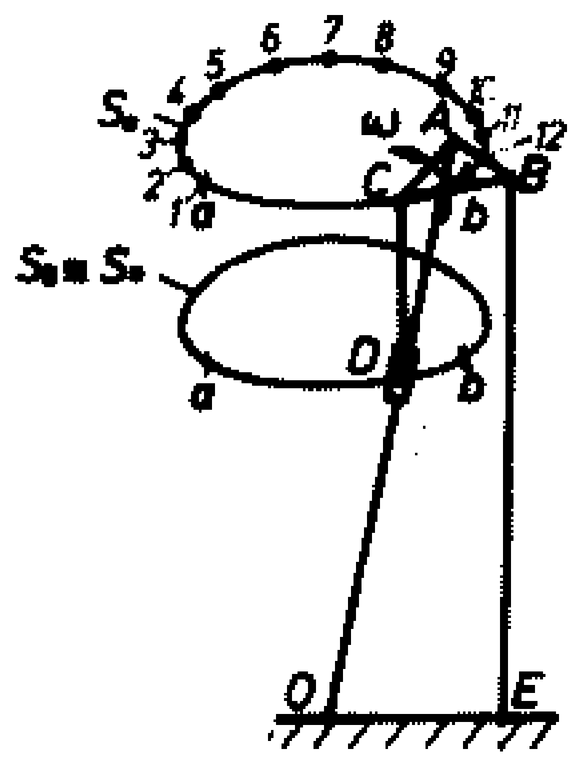

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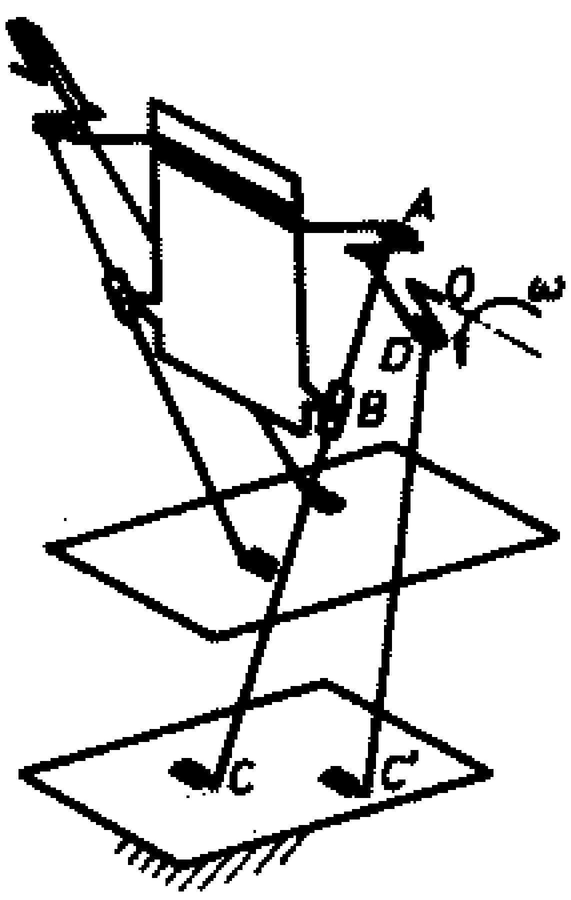

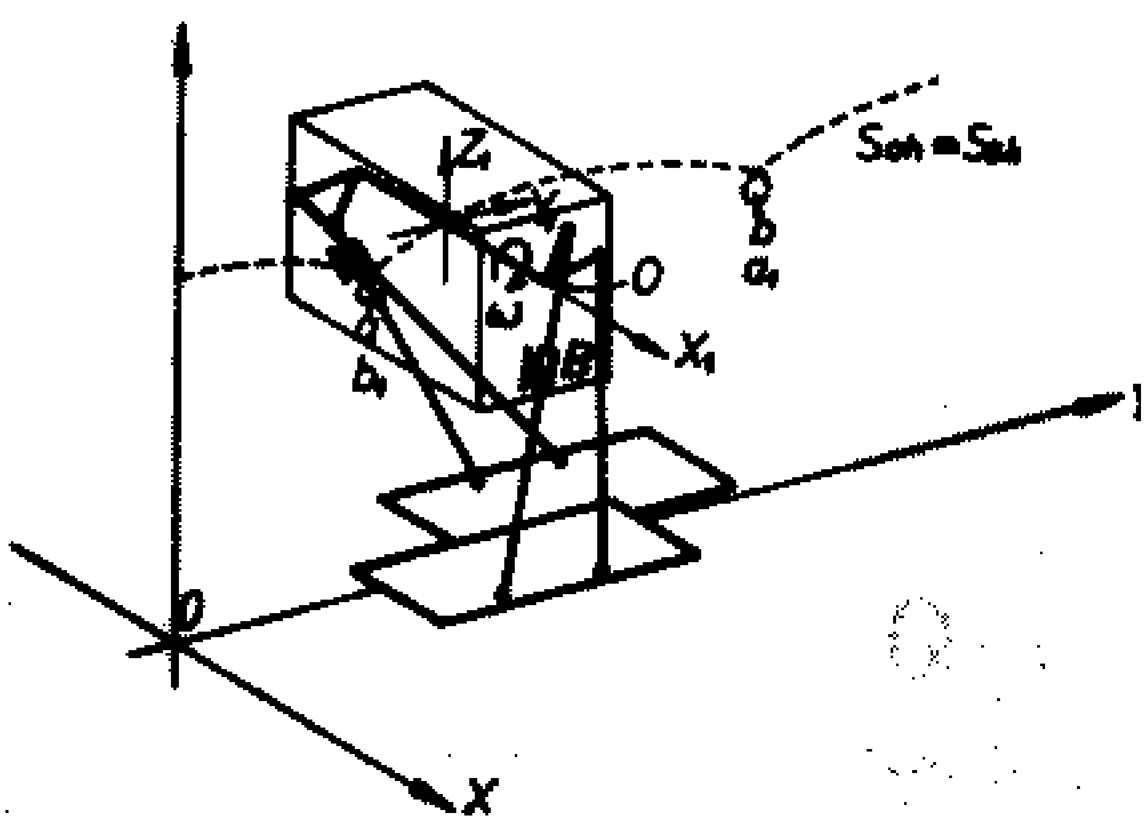

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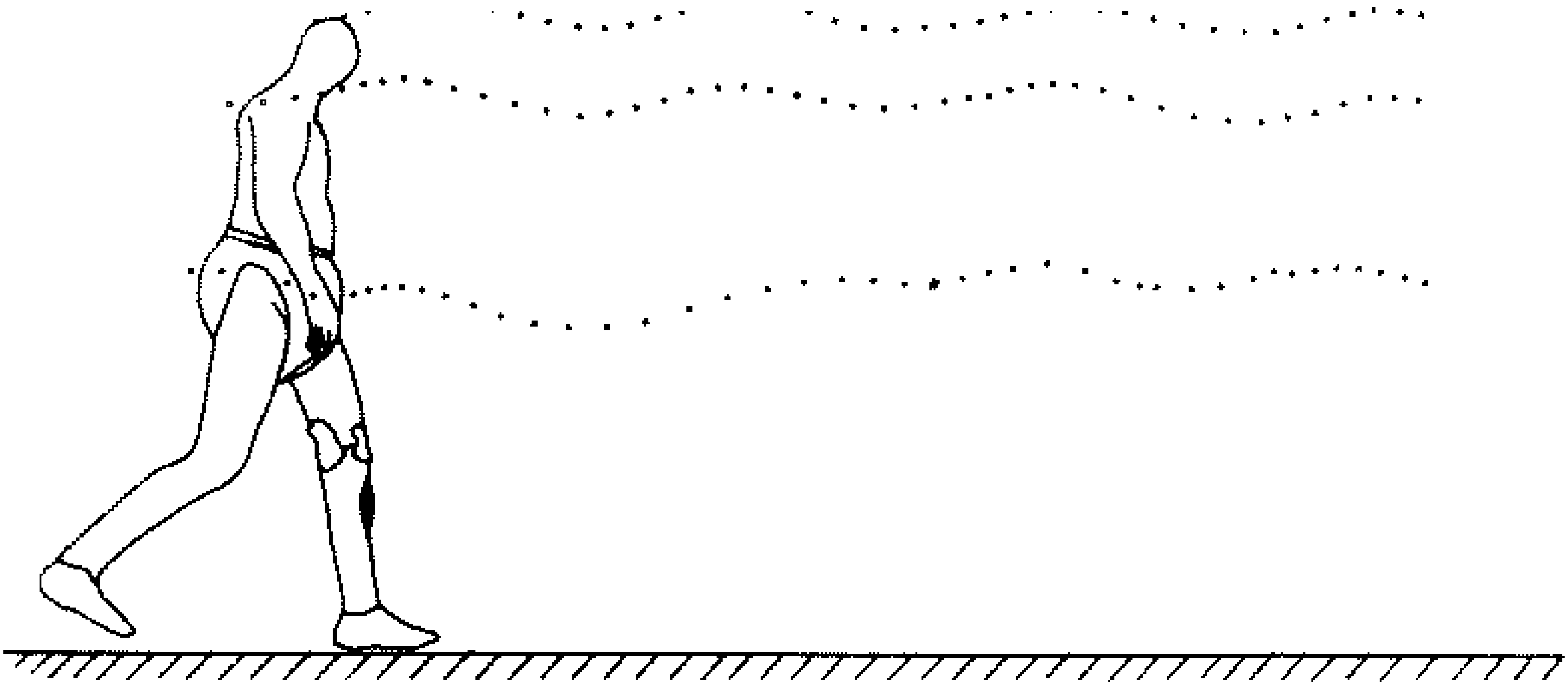
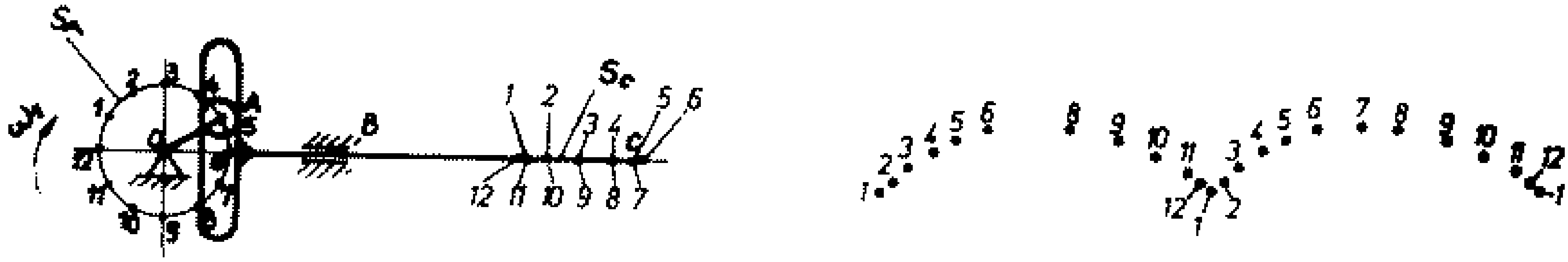


Fig. 5



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