INTERNATIONAL MULTIDISCIPLINARY JOURNAL FOR RESEARCH & DEVELOPMENT
SJIF 2019: 5.222 2020: 5.552 2021: 5.637 2022:5.479 2023:6.563 2024: 7,805
eISSN :2394-6334 https://www.ijmrd.in/index.php/imjrd Volume 11, issue 06 (2024)

LAWS OF MOTION OF THE CAM MECHANISM WITH AN ECCENTRIC ROLLER

Khudayberdiyeva Makhliyo Abdukakhorovna

Doctoral student of Bukhara Engineering-Technological Institute.

Tel: (+99893)450-2313, e-mail: khudayberdiyeva01231989@gmail.com

Abstract: The article describes the motion laws of the eccentric roller pusher fist mechanism, the kinematic scheme of the eccentric roller pusher fist mechanism, the fist mechanism equipped with structural fists and its motion laws. The kinematic characteristics of the crank mechanism with composite cams have been analyzed, and the main parameters of the system have been substantiated.

Key words: Cam mechanisms, roller, pusher, connecting rod, lever, shaft, pulley

With the existing cam mechanisms, which include a base, a cam, a roller and a follower, it is quite difficult to obtain a complex movement law of the follower. To do this, you need to complicate the curvature of the cam, but making such a cam is very difficult.

The most common is the cam mechanism, which contains a cam and a roller in contact with it, pivotally mounted on a pusher.

The disadvantage of these cam mechanisms is their low kinematic capabilities.

Our goal is to expand the kinematic capabilities of the cam mechanism by shifting the connection point between the roller and the pusher.

The essence of the proposed cam mechanism is that in a cam mechanism with an eccentric pusher roller containing a base, a cam, a roller, a pusher, the pusher roller is installed eccentrically relative to its center.

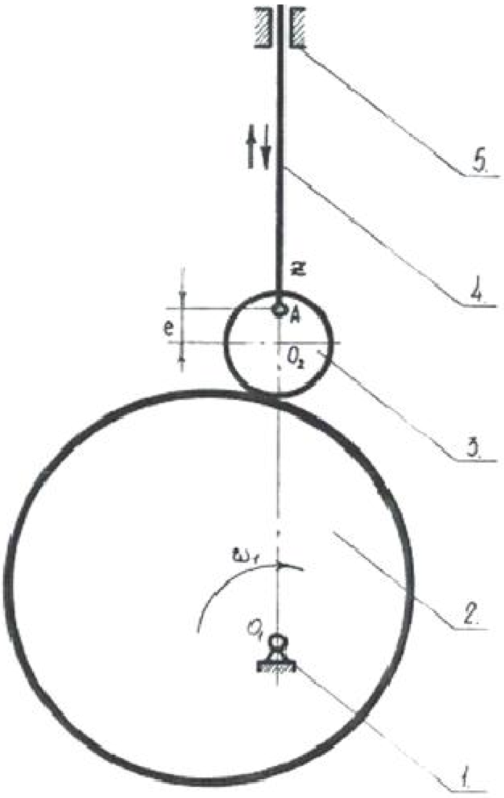
As a result of this, the roller becomes an active link, which makes it possible to obtain complex laws of motion of the cam pusher. In this case, due to the eccentricity of the pusher roller, the distance from the center of rotation of the roller to the point of contact of the roller with the cam will change. That is, the O2 axis will approach and move away from the point of contact between the cam and the roller. Thus, the law of movement of the pusher will be influenced not only by the cam profile, but also by the roller. The result is a more complex law of motion of the driven link - the pusher.

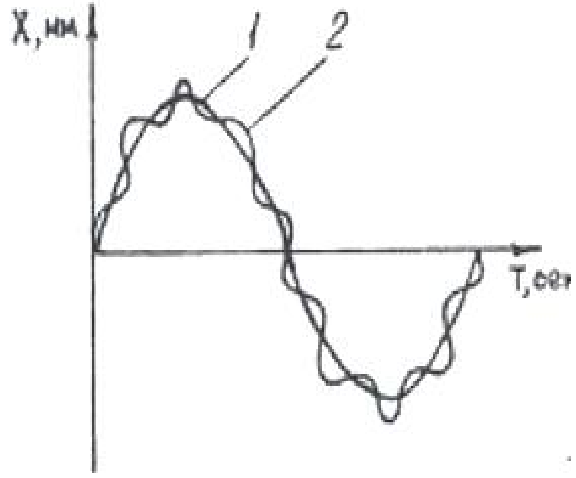
The drawing shows: in Fig. 1., a - kinematic diagram of the proposed cam mechanism with an eccentric roller, in Fig. 1, b - graph of the expected law of motion of the pusher.

A cam mechanism with an eccentric pusher roller contains bases 1 and 5, a cam 2 pivotally mounted on base 1, a roller 3, a pusher 4. The pusher 4 is pivotally connected to roller 3 at point A at a distance e from the center of roller 02. This is what distinguishes the proposed cam mechanism from existing ones.

The proposed cam mechanism works as follows:

Cam 2 rotates around axis O1 with angular velocity ω1. Roller 3 rolls along cam 2, exactly repeating its profile. Pusher 4 performs a forward-return movement along the Z-Z axis. Law of pusher motion dictated by the profile of cam 2, as well as roller 3, since the connection point between the roller and the pusher is offset by a distance e from the center of the roller. Thus, the pusher 4 makes its movement, firstly, repeating the profile of the cam 2, and secondly, due to the approach and removal of the point of hinge connection of the roller 3 and the pusher 4 - 02 from the point of contact of the cam 2 and the roller 3. Due to this, the law becomes more complicated pusher movements 4.





a) b)

Fig. 1 a) Kinematic diagram of a cam mechanism with an eccentric roller of a pusher.

INTERNATIONAL MULTIDISCIPLINARY JOURNAL FOR RESEARCH & DEVELOPMENT
SJIF 2019: 5.222 2020: 5.552 2021: 5.637 2022:5.479 2023:6.563 2024: 7,805
eISSN :2394-6334 https://www.ijmrd.in/index.php/imjrd Volume 11, issue 06 (2024)

b) graph of the expected law of motion of the pusher.

This complex law of movement of the pusher is shown schematically in Fig. 1, where curve 1 is the law of movement of the pusher of the existing mechanism, and curve 2 is the complex law of movement of the pusher of the proposed cam mechanism with an eccentric roller pusher.

In existing cam mechanisms, the degree of freedom is 1, since the rollers of these mechanisms are passive. In the proposed cam mechanism, the roller becomes an active link, that is, it affects the operation of the mechanism and the degree of freedom will be as follows:

$W = 3n - 2P_V - 2P_{IV} = 3*3 - 2*3 -1=2$

that is, the mechanism has two degrees of freedom. In this case, it is possible to control the law of movement of the pusher 4 of the cam mechanism.

As stated above, with the existing cam mechanisms that contain the base, cam, roller and pusher described, it is quite difficult to obtain complex laws of motion of the output link - the pusher. To do this, you need to make a cam with a complex profile curvature, but this is a very labor-intensive and expensive process.

The most common is a cam mechanism containing a cam and a roller in contact with it, pivotally mounted on a pusher.

A cam mechanism with a composite roller is also known, containing a base, a cam, a composite roller consisting of a central hinge, an elastic sleeve in the shape of an ellipse and an outer disk, a pusher and a spring [3].

The disadvantage of this cam mechanism is the low kinematic ability.

Our goal is to expand the kinematic capabilities of the cam mechanism, i.e. obtain a complex law of motion of the output link - the pusher with a simple curvature of the cam profile.

This problem is solved by using an elastic element in the cam design.

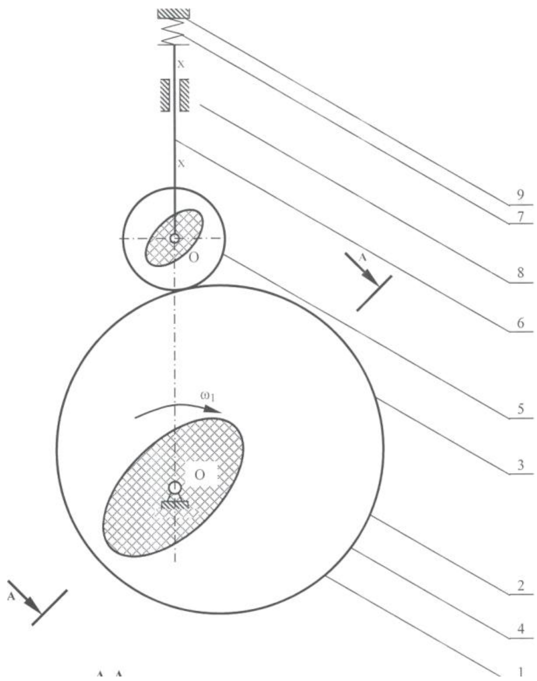
The essence of the cam mechanism we propose is that in the cam mechanism containing a base, a cam, a composite roller, a spring, an elastic element in the shape of an ellipse is built into the cam.

This mechanism is shown in the drawing, where Fig .2 shows the kinematic diagram of the proposed cam mechanism; in Fig. 3 - section A-A.

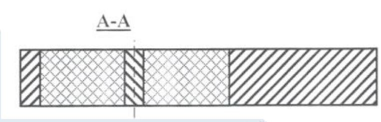
A cam mechanism with a compound cam contains bases 1, 8 and 9, a compound cam 2 hinged on the base 1, a roller 3, an elastic element 4 built into the cam, an elastic element 5 built into the roller, a pusher 6, a spring placed between the base 8 and the pusher 6 7. Elastic elements 4 and 5 are made in the shape of an ellipse. Depending on the required law of motion of the pusher 6, the elastic elements 4 and 5 can be in any other form.

The proposed compound roller cam mechanism works as follows:

Composite cam 2 rotates around axis O1 with angular velocity ω1. Roller 3 rolls along cam 2, exactly repeating its profile. Pusher 6 makes a forward-return movement along the x-x axis. The law of motion of the pusher 6 is dictated by the profile of the composite cam 2, as well as the composite roller 3. Since the elastic element 4 of the composite cam 2 is made in the form of an ellipse, it has the largest and smallest radii. Where the largest radius coincides with the x-x axis, the deformation of the elastic element will be greater than where the smallest radius coincides with the x-x axis.



Rice. 2. Cam mechanism with compound roller.



Rice. 3. section A-A

Consequently, the point of contact of cam 2 and roller 3 during the rotation of cam 2 will approach and move away from the base 1. Similarly, due to the fact that the elastic element 5 of the composite roller 3 has the largest and smallest radii, the hinge point of roller 3 and pusher 6-02 will be approach and move away from the point of contact of cam 2 and roller 3. To obtain the necessary deformation, and therefore the necessary law of motion of the pusher 6, a spring 7 is also used.

REFERENCES

1. А.Д.Джураев, Ш.Мадрахимов, С.Уринова, Ф.Турсунов. Батанный механизм ткацкого станка // Патент Респ. Узб. № FAP 01246, Бюлл. №10. 31.10.2017.

2. А.Д.Джураев, Ш.Мадрахимов, С.Уринова. Батанный механизм ткацкого станка // Патент Рес. Узб. № IAP 05491, Бюлл. №11. 30.11.2017..

3. Тўқимачилик машиналари конструкцияси, ҳисоблаш ва назарияси асослари.М., ―Машиностроение‖ , 1975, 217-221 бетлар.

4. Якубовский Ю.В., Живов В.С., Коритысский Я.И., Мигушов И.И., Основы механики нити. М., «Легкая индустрия», 1973, 273 с.