CONTROL SYSTEM FOR THE TRANSVERSE RECIPROCATING MOVEMENT OF A TOOL-HOLDER CARRIAGE FOR THREAD-CUTTING MACHINES

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The present invention relates to thread-cutting machines and is particularly directed to such machines having means controlling the transverse reciprocating movement of the tool-holder carriage.

The reciprocating transverse movement of the tool-holder carriage providing for the engagement and release of the tool in thread-cutting machines has been previously obtained by means of a linear wedge-shaped cam, fitted between two movable elements of the mechanism controlling the transverse carriage of the machine tool.

This led to the localization of considerable stresses at the two points at which the wedge-shaped cam is in contact with the corresponding movable elements and this resulted in considerable wear which detrimentally affected the accuracy of the diameter of the thread to be cut.

On the other hand, the transmission of movement, as provided by a wedge-shaped cam has been previously provided by lever-shaped members, which, under the effect of the considerable stresses to which they were subjected, detrimentally affected the accuracy of the diameter of the thread.

It is an object of the present invention, to eliminate these drawbacks and to produce simple and particularly rigid movement transmission means.

It is known, furthermore, that in certain thread-cutting machines, the movement of the transverse carriage of a machine tool is obtained as a result of an intermittent depthwise leader movement provided by a cam having an adjustable eccentricity and of a reciprocating engaging and releasing movement produced by another cam, the movement of which is synchronized with that of a third cam producing the longitudinal reciprocation of the tool. Said eccentric adjustable cam may be provided for example by the variable cam disclosed in the U.S. Patent No. 2,709,924. It is a further object of the invention, to provide an improved transmission of movement between the eccentric cam on such thread-cutting machines and the transverse carriage on said machines.

According to the present invention, an annular rocking cam is fitted round the above-mentioned adjustable eccentric cam while a roller or shoe pivotally secured to the end of a sliding stem engages said annular cam, and the other rack-shaped end of said sliding stem meshes with corresponding teeth on a rotary and sliding shaft. Said shaft is provided with further teeth meshing with the rack-shaped section of a pusher member acting on the transverse carriage of the machine, through the agency of a shoe against which the above-mentioned carriage is urged by springs.

The actual location of the rotary and sliding shaft may be modified as desired through adjusting means, including for instance a micrometric thrust-exerting screw provided with a scale-carrying drum and a return spring urging the sliding shaft maintaining contact relationship with said micrometric screw.

The two above-mentioned racks are provided with teeth and slopes of which are different and a longitudinal shifting of the rotary sliding shaft produces a relative movement between the racks, and, consequently, a transverse shifting of the shoe associated with the transverse carriage.

The released position of the tool may be adjusted by a limitation of the amplitude of the receding movement of the transverse carriage under the action of its return spring through the agency for instance of a further micrometric screw provided with a scale-carrying drum engaging the rear end of the pusher member actuating the transverse carriage.

The accompanying drawings illustrate, by way of example, and by no means in a limiting sense, an embodiment of the object of the present invention. In said drawings:

Fig. 1 is an elevational partial cross-sectional view of the saddle and of the carriages of a thread-cutting machine.

Fig. 2 is a cross-section through line II—II of Fig. 1.

Fig. 3 is a partial sectional view similar to Fig. 2, but showing the annular rocking cam in a second position.

Figs. 4 and 5 are two partial views in two different positions of a modification of the annular rocking cam together with the means transmitting movement between said cam and the transverse carriage.

In said drawings, the conventional saddle of a thread-cutting machine of which 2 designates the longitudinal carriage sliding freely over the saddle, while 3 designates the transversely movable carriage serving as a support for the tool-holder 4.

The invention resorts to the following mechanism for obtaining the transverse movement of the carriage 2 for engagement and release of the operative tool 5.

The annular oscillating cam 6 is pivotally secured at 9 a connecting rod 10 controlled by a lever 11 pivotably secured at 12 to said connecting rod and pivoting round a stationary stud 13. Said lever 11 carries on its lower arm subjected to the action of a return spring 14, a roller 15 which is in contact with the outline of a cam 16 carried by the shaft 17 which also carries a further cam which is not illustrated and over which runs a roller producing the reciprocation of the longitudinal carriage of the thread-cutting machine: These arrangements of an eccentric cam such as 7 and of a shaft such as 17 positioned in the saddle 1 of the machine and carrying the cam controlling the movements of the longitudinal carriage are known per se and they may be provided in accordance with the disclosure in said U.S. Patent No. 2,709,924. They are therefore not claimed in the present application.

The bearing surface between the rocking cam 6 and the eccentric cam 7 is constituted by the entire peripheral surface of the latter.

The transmission of movement to the transverse carriage 3 is ensured through the rocking cam 6 by a broad cylindrical roller 18, freely revoluble at the outer end of a sliding rod 19, the upper end of which has a rack shape, as shown at 20. The rack 20 thus provided meshes with a pinion having cooperating teeth 21 and which is fixedly connected to a shaft 22 adapted to rotate and to move translationally in an entirely free manner inside the saddle.

The shaft 22 carries a further series of peripheral teeth 26 meshing with a further rack 27 fixedly connected to a pusher member 28 adapted to slide and to urge...
into movement through the agency of the oscillating shoe 31 the transverse carriage 3 which is urged against said shoe 31 by springs which are not illustrated.

The rocking movements of the annular cam 6 produce rising and lowering movements of the sliding rod 19 through the agency of the roller 18 and, consequently, this produces reciprocating rotary movements of the shaft 22 through the agency of the interengaging teeth at 20 and 21.

These reciprocating rotary movements of the shaft 22 produce in their turn a reciprocation of the pusher member 28 and, consequently, of the transverse carriage 3 through the agency of the gear teeth 26 and 27 and of the shoe 31.

Furthermore, the shaft 22 which is slideably carried in a corresponding recess of the saddle 1 is held axially by a spring 23 is contacting relationship with a micrometric screw 24 carried by the saddle 1 and provided with a scale-carrying drum 25 which permits defining the position of the screw 24 and shaft 22.

The teeth 21 and 26 carried by the shaft 22 are given different slopes and it is obvious that any axial shifting of the shaft 22 leads to a rotation of said shaft and, consequently, to a relative movement of the pusher member 28. The shifting of the pusher member 28 is in its turn transmitted to the transverse carriage 3 and to the thread-cutting tool 5, whereby it is apparent that it is possible to adjust the diameter of the thread through the agency of the scale-carrying drum 25.

When the mechanism is in its released position, as illustrated in Fig. 3, the rearmost location of the transverse carriage 3 may be adjusted through a micrometric screw 29 (Fig. 2) carried by the saddle 1 and provided with a scale-carrying drum 30 through which the location of the screw and rearmost position of the carriage 3 may be defined.

As a consequence of the above-described arrangement forming the object of the present invention, it is possible to obtain not only a particularly rigid and simple transmission of movement, but also a high accuracy in the diameter of the thread to be cut.

In the modifications illustrated in Figs. 4 and 5, the transmission of movement between the annular oscillating cam 6 and the transverse carriage is provided through the agency of a shoe 32 pivotally and freely secured to the end of the sliding rod 19.

What I claim is:

1. In a thread-cutting machine including a saddle, a longitudinal carriage adapted to slide longitudinally on said saddle and a tool-holder carriage adapted to assume a reciprocating transverse movement over said longitudinal carriage, the provision of means controlling the transverse reciprocating movement of said tool-holder carriage and comprising an eccentric cam carried by the saddle and adapted to revolve round a horizontal axis, an annular cam fitted round the periphery of said eccentric cam, means for imparting to said annular cam a rocking movement round the eccentric cam, a vertical rod adapted to slide vertically inside the saddle, a bearing member carried at the lower end of said rod and engaging said annular cam, teeth rigid with said shaft and of which one meshes with the vertical rack, a member adapted to slide longitudinally inside the saddle in a direction parallel with said direction of transverse movement and including rack-forming teeth meshing with the second series of teeth on said shaft and the slope of which is different from the slope of the rack-forming teeth on the vertical rod, a micrometric screw carried by the saddle and the tip of which engages the end of said shaft for adjusting its axial location, elastic means urging said shaft into permanent engagement with the micrometric screw and a push member operatively connected with the end of said sliding member facing the tool-holder carriage and adapted to transmit to the latter the thrust exerted by said sliding member upon actuation by the annular cam, the rod and teeth and rack systems.

2. In a thread-cutting machine including a saddle, a longitudinal carriage adapted to slide longitudinally on said saddle and a tool-holder carriage adapted to assume a reciprocating transverse movement over said longitudinal carriage, the provision of means controlling the transverse reciprocating movement of said tool-holder carriage and comprising an eccentric cam carried by the saddle and adapted to revolve round a horizontal axis, an annular cam fitted round the periphery of said eccentric cam, means for imparting to said annular cam a rocking movement round the eccentric cam, a vertical rod adapted to slide vertically inside the saddle, a bearing member carried at the lower end of said rod and engaging said annular cam, teeth rigid with said shaft and of which one meshes with the vertical rack, a member adapted to slide longitudinally inside the saddle in a direction parallel with said direction of transverse movement and including rack-forming teeth meshing with the second series of teeth on said shaft and the slope of which is different from the slope of the rack-forming teeth on the vertical rod, an annular cam fitted round the periphery of said eccentric cam, means for imparting to said annular cam a rocking movement round the eccentric cam, a vertical
rod adapted to slide vertically inside the saddle, a bearing member carried at the lower end of said rod and engaging said annular cam, teeth rigid with the upper end of said rod and forming a vertical rack, a shaft adapted to revolve freely inside the saddle and extending perpendicularly to the direction of transverse movement of the tool-holder carriage, two series of peripheral teeth rigid with said shaft and of which one meshes with the vertical rack, a member adapted to slide longitudinally inside the saddle in a direction parallel with said direction of transverse movement and including rack-forming teeth meshing with the second series of teeth on said shaft and the slope of which is different from the slope of the rack-forming teeth on the vertical rod, a pusher member operatively connected with the end of said sliding member facing the tool-holder carriage and adapted to transmit to the latter the thrust exerted by said sliding member upon actuation by the annular cam, the rod and teeth and rack systems, and an adjustable stop carried by the saddle and adapted to engage the end of the pusher member facing away from the tool-holder carriage to define the outermost position of the tool-holder carriage during its reciprocation.

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