Oct. 4, 1949. J. M. TUTEN 2,483,987

PICK MECHANISM FOR LOOMS

Filed Feb. 6, 1947 2 Sheets-Sheet 1

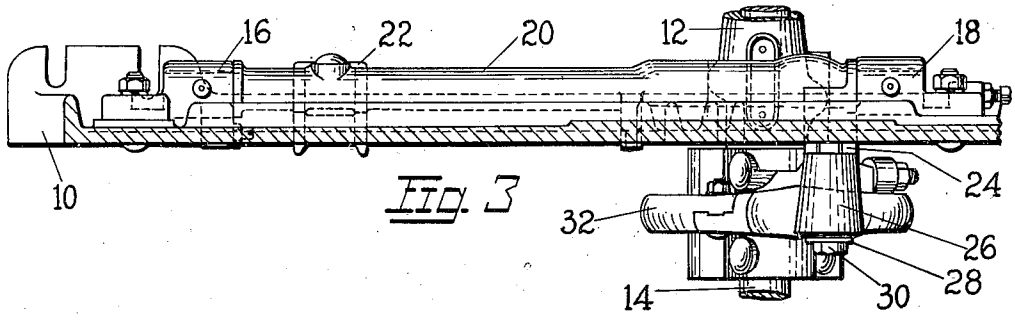

Fig. 3

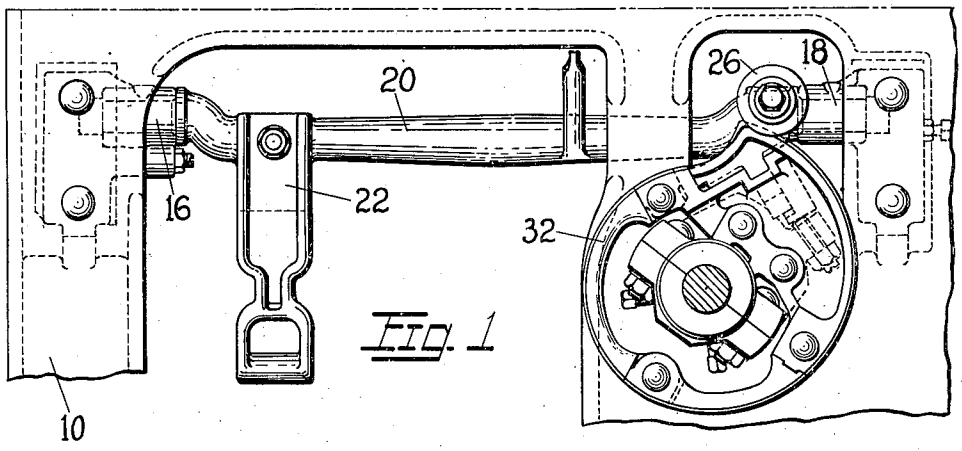

Fig. 1

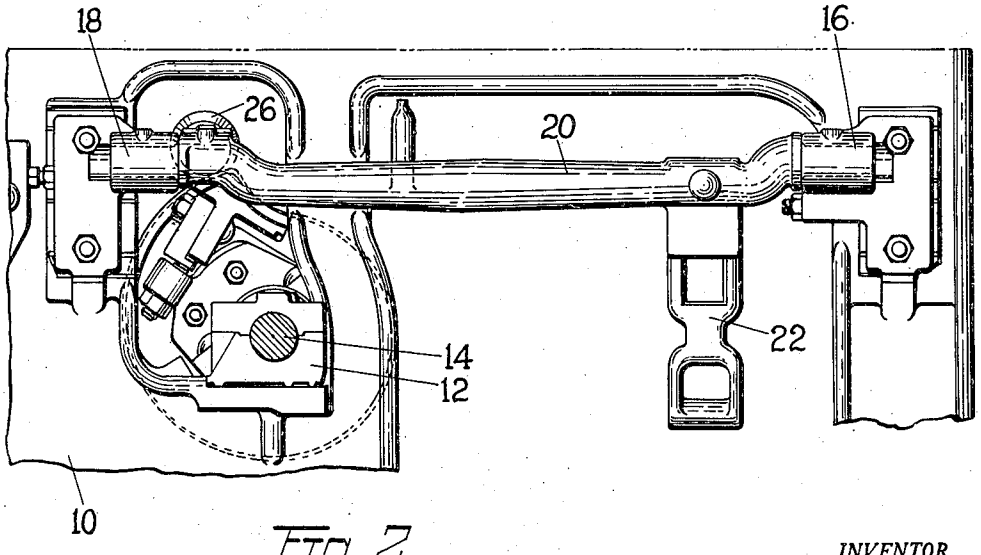

Fig. 2

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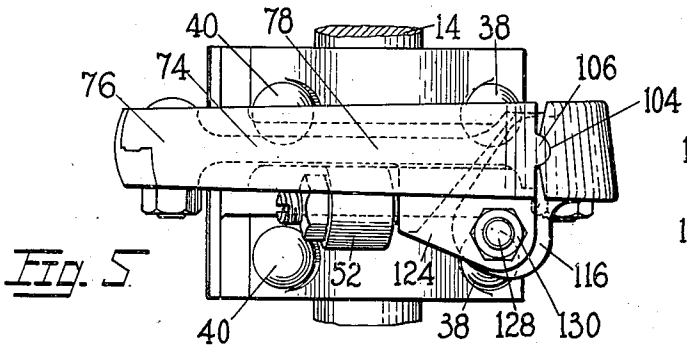

Fig. 5

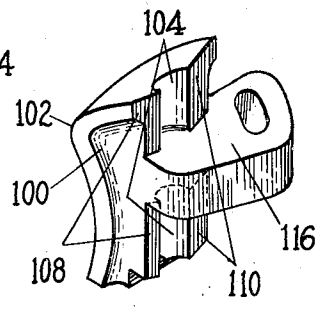

Fig. 8

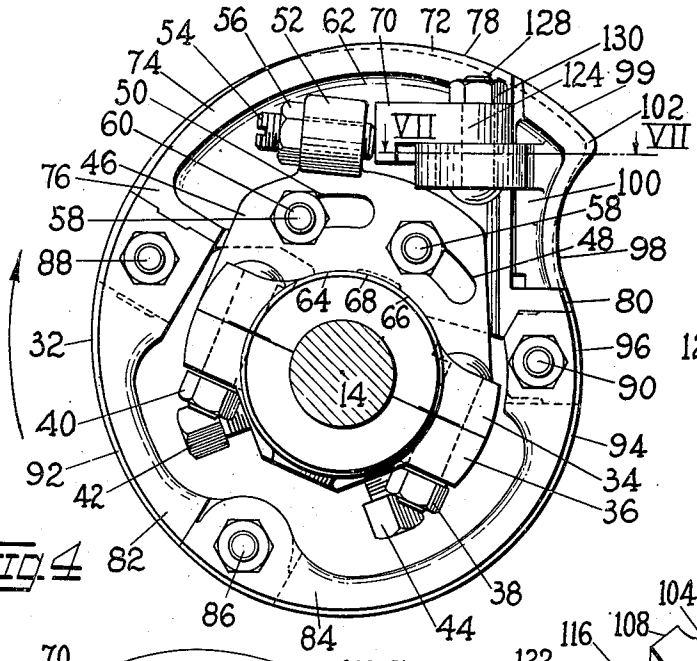

Fig. 4

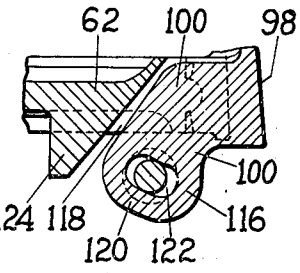

Fig. 7

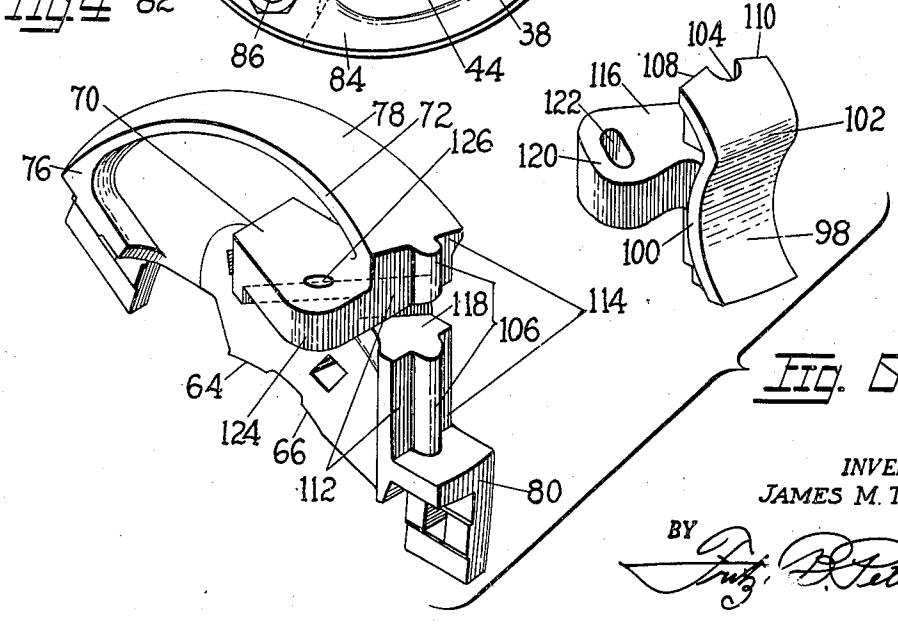

Fig. 6

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PICK MECHANISM FOR LOOMS

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Application February 6, 1947, Serial No. 726,921

10 Claims. (Cl. 139—147)

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This invention relates to looms employing pickers and more particularly to an improved pick cam and associated structure for such looms.

In looms of the type mentioned there is provided at each side of the loom a picker for engaging and propelling the shuttle or shuttles between shuttle boxes. The pickers are attached to or form integral portions of picker sticks which are periodically and sequentially actuated, usually with an extremely rapid whipping motion, to impart an adequate amount of momentum to the shuttle or shuttles to cause the latter to exit from one box and travel to and enter a box at the opposite side of the loom. To impart to the picker stick in each instance the rapid movement necessary to properly accelerate the shuttle there is usually provided a rockable pick shaft arranged along a loomside and having a pick arm connected to the picker stick by a suitable strap or connector, the parts being so arranged that rocking of the pick shaft results in the strap being pulled and it in turn moving the picker stick. To rock the pick shaft there is a pick cam secured on a rotatable cam shaft and arranged to give movement to a follower or pick ball mounted on an arm of the pick shaft. The pick ball acts with a relatively small lever arm to rock the pick shaft. The cam is provided with a cam face or periphery having a very steep rise, which, in conjunction with the short lever arm of the pick ball, is effective to impart to the pick shaft a very rapid or sudden partial rotation about its axis. The remainder of the cam face forms a gradual fall which is effective to allow relatively slow return of the pick ball and pick shaft to their initial positions. Since the pick shaft extends along a loomside and the cam shaft extends across the loom from one side to the other, the cam follower or pick ball oscillates about an axis generally transverse to the axis about which the cam rotates. As a consequence the active surface of the cam is of complex curvature. The follower or pick ball is generally formed as a right truncated section of a cone, and the cam surface is designed to provide as nearly as is possible linear contact between that surface and the surface of the pick ball, for the obvious purpose of distributing the contact forces over a maximum of cam surface. It is known that a rough approximation to linear contact, or even only point contact, is acceptable insofar as the entire fall and dwell portions of the cam are concerned, since the force transmitted from the cam to the pick ball, or vice versa, is relatively small during the falling or return motion of the pick ball, and is insignificant during

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the dwell. However, linear contact becomes increasingly important over the rise of the cam, and becomes critical near the cusp of the cam, since the force transmitted from the cam to the pick ball rises precipitously as that part of the cam surface contacts the pick ball. If absolute linear contact is not secured at and near that of the cam surface at which the transmitted force reaches a maximum value, extremely rapid wear of the cam and of the pick ball occur, in spite of the fact that these parts are made of very hard metal. Since action of the picker stick must be quite uniform over a long period of time if the loom is to operate in a commercially satisfactory manner, and since the actuation of a given picker occurs generally oftener than once per second of time during normal loom operation, it is evident that wearing of the pick cam and pick ball are matters of serious concern.

As has been mentioned, the pick cam surface and the pick ball have heretofore been made of very hard metal, in an effort to alleviate the adverse effects of rapid wear of these parts. Further, they have been designed to be easily replaced when worn. It has been found expedient in some instances to provide a plural-piece cam having a replaceable toe, the toe including the rise and cusp portions of the cam and being subjected to the greatest wear. It also has been found to be economical to provide the cam with a replaceable toe piece with means whereby the toe may to some extent be adjusted along the cam periphery, to provide for easy timing of the cam. It has, however, been accepted as inevitable that during casting and hardening of the cams or their parts a certain amount of unpredictable distortion will occur, which distortion results in poor cam face to follower contact. That distortion does occur is certain, and its extent and direction may be only roughly determined beforehand. It has been found to be impractical to machine the parts to remove the distortion because of the expense of grinding the hardened surfaces and because grinding either destroys at least a part of the hardened surface or renders the hardness non-uniform over the active cam surface of the parts. Accordingly it has been the practice to accept wear and its resulting evil of variable picking action and lost loom time as inevitable, and to replace the worn parts relatively often.

With the above considerations in view, it is an object of the present invention to provide a loom pick cam having a toe support and a toe positively adjustable on the support to a position in

which absolute linear contact with a pick ball may be secured at any desired point along the active surface of the toe. It is a further object of the invention to provide a loom pick cam having a hub and a rim composed of a plurality of cam face forming members and comprising two parts one of which may be pivotally adjusted and locked with respect to the other about an axis lying in a plane substantially perpendicular to the axis of the hub, whereby absolute linear contact may be secured between said one part and an associated pick ball. Other objects and features of the invention will hereinafter become apparent from a consideration of the following description and accompanying drawings wherein is disclosed a preferred embodiment of the invention. In the drawings:

Fig. 1 is a view in elevation of a portion of a loomside as seen from within the loom and showing a pick cam according to the invention and the general environment of the cam and cooperating structures;

Fig. 2 is a view showing the structure illustrated in Fig. 1 but as seen from outside the loom;

Fig. 3 is a top view of a portion of a loom including the structure shown in Figs. 1 and 2, with an additional portion of the loomside;

Fig. 4 is a view in elevation of a pick cam according to the invention;

Fig. 5 is a top view of a pick cam according to the invention as depicted in Fig. 4;

Fig. 6 is a pictorial view of portions of a pick cam according to the invention, in "exploded" relationship;

Fig. 7 is a sectional view taken along a plane indicated by line VII—VII of Fig. 4; and

Fig. 8 is an isometric view of the pick cam toe isolated from the remainder of the cam.

Referring to the drawings, wherein there is depicted only so much of conventional loom structure as is necessary to a complete understanding of the invention, numeral 10 designates a portion of one loomside of a loom. Since the two pick cams used on any given loom are similar and differ only in being of opposite hand, the description will be limited to the cam at one side of the loom. It should be kept in mind that the invention is applicable to either right-hand or left-hand loom pig cams. Extending transversely of loomside 10 and mounted for rotation in cam shaft bearings 12 (only one of which is illustrated) is a cam shaft 14. Mounted for rocking movement in bearings 16, 18, attached to loomside 10, and extending along the loomside, is a pick shaft 20 carrying near its forward end a pick arm 22. The pick arm is arranged for connection to conventional picker mechanism (not shown) including a lug strap and picker stick. Near its other end the pick shaft 20 carries a lateral stub 24, (see Fig. 3), preferably formed integrally with the pick shaft and having rotatably mounted on its end a cam follower or pick ball 26. The pick ball is preferably formed as a right-truncated cone with a bearing bore arranged axially through the ball, and may be secured to the stub 24 by means of a washer 28 and cap screw 30 threaded into a tapped hole in the end of stub 24. The structure hereinabove enumerated is conventional and per se is not of the present invention. The operation of that structure is well known to those skilled in the loom manufacturing art.

In attaining the objects of the invention there is provided for actuating the pick ball a plural-

part pick cam 32 having novel features of construction and adjustability which will hereinafter more fully be pointed out. Referring to Figs. 4, 5, 6 and 7, wherein the pick cam is shown in detail, the cam has a hub comprising two members, 34 and 36, which preferably have finished interior coacting and cam shaft engaging faces. The two hub members are adapted to be assembled on the cam shaft 14 and held together by suitable means such as by bolt and nut means 38, 40, passed through aligned holes formed in the members, all as shown in the mentioned figures. The lower hub member 36 may be provided with set screws 42, 44 whereby the cam may be securely fastened to the cam shaft for rotation thereby; but it is evident that other equivalent means may be provided for this purpose or as an additional means of securing the hub to the cam shaft. The upper hub member 34 has formed integral therewith a plate-like extension 46 having elongated preferably arcuate holes 48, 50, for a purpose to be made evident hereinafter. Outwardly of hole 50 the extension 46 carries a boss 52 having a threaded bore in which is threaded a stop screw 54. The stop screw 54 is made sufficiently long to extend outwardly from boss 52 in opposite directions, and may be fixed in adjusted position on the boss by means of a lock nut 56.

Adjustably supported upon plate portion 46 of the hub member are means comprising a plurality of parts forming a rim presenting the active cam surface. Secured to plate portion 46, as by means of bolts 58, 60 extending through respective holes 48, 50, is a toe support 62. The toe support preferably is provided with machined or finished faces 64, 66, arranged and formed to fit closely against a complementary finished surface 68 on hub member 34. These finished surfaces are made arcuate and with the axis of the hub of the cam 32 as a center, whereby, with bolts 58, 60 loosened, the toe support may be circumferentially adjusted with respect to the hub of the cam, the bolts 58, 60 riding in the arcuate holes 48, 50 during the adjusting process. With bolts 58, 60 tightened with toe support 62 in adjusted position, stop screw 54 may be turned into firm engagement with an abutment 70 formed on the toe support, and lock nut 56 tightened. Thus the toe support is firmly supported on the hub in adjusted position and prevented from undesirable slipping with respect to the hub.

Toe support 62 is formed to constitute two sections of the cam face of the pick cam, and to support additional structures presenting the remaining sections of the cam face. To this end, the toe support is formed with a generally arcuate double-flanged portion 72 which tapers slightly in width through a portion 74 terminating in an enlargement 76. See Figs. 4 and 5. The portions 72, 74 and 76 provide a first cam face section 78 which constitutes part of the fall fraction of the cam face. The second cam face section provided by toe support 62 is formed by an extension 80 situated at the extremity of the toe support opposite from enlargement 76. (See Figs. 4 and 6.)

Enlargement 76 and extension 80 are arranged to support respective ends of an articulated portion of cam 32. This articulated portion comprises members 82 and 84 formed with coacting plane surfaces and aligned holes through which a pin or bolt 86 is fitted to secure adjacent respective ends of the members together. One end

of member 82 is formed with faces complementary to faces formed on enlargement 76 and aligned holes are provided in the two elements through which a bolt or pin 88 passes to secure member 82 to the toe support. One end of member 84 is similarly provided with faces complementary to faces formed on extension 80, and these elements have aligned holes through which a bolt or pin 90 is passed to secure member 84 to the toe support. Members 82 and 84 are so formed that when interconnected at bolt 86 and connected to the toe support at bolts 88 and 90, respectively, they form cam face sections 92, 94 smoothly merging, respectively, with cam face section 78 and cam face section 96 formed on extension 80. The cam face sections 92 and 94 provide only a very slight fall and rise and accordingly members 82 and 84 need not have great strength. The short sections of the cam face lying between section 96 and 78 include practically all of the rise of the cam, which is the region in which the force transmitted from the cam to the pick ball increases rapidly to a high maximum value, and additionally include a short fall. These short sections are designated 98 and 99, respectively, and with the other previously mentioned cam face sections complete the peripheral cam face of the cam.

Cam face sections 98 and 99 are comprised on a pick cam toe 100 of novel construction and arrangement. It may be pointed out that as the pick cam rotates in the direction of the arrow (Fig. 4), with the follower or pick ball idly rolling in successive contact with cam face sections 92, 94 and 96, practically no force is transmitted from the cam to the pick ball, and accordingly the widthwise contour of the cam face constituted by those sections is not of great importance, and any type of contact of the pick ball with the cam face is acceptable. As the cam continues its rotation in the direction of the arrow and the pick ball is forced to ride upwardly on the rise of the cam included in section 98, the force transmitted to the pick ball by the cam increases rapidly, attaining a maximum value near the cusp 102 where acceleration of the pick ball becomes a maximum. Over that area of the cam face section 98 near the cusp 102 and in which the mentioned force attains its maximum value it is of relatively great importance to have maximum contact, i. e., full linear contact between the pick ball and the cam face. Heretofore it has been a matter solely of chance whether or not that desirable situation obtained, and more often than not linear contact of the pick ball with the same has not been secured. The novel pick cam toe 100 is arranged so that the cam face section 98 can readily be adjusted and locked in position to provide full linear contact with the pick ball at any desired point along the cam face and to provide either full linear contact or substantially linear contact at other points along the cam face. To provide this close fitting of the cam toe to the pick ball the toe 100 and toe support 62 are constructed and arranged to allow the toe to be pivotally rotated about an axis lying in a plane substantially perpendicular to the axis of the cam; that is, the toe may be rotated into a position wherein full linear contact with the pick ball is secured at any desired point along the cam face section constituting the rise of the cam. After having been rotated into proper position, the toe may be locked in that position.

To provide for the previously mentioned rotation of the toe into adjusted position, the toe 100 is formed with arcuate depressions 104 having finished surfaces, and toe support 62 is formed with complementary arcuate protuberances 106 finished to fit within depressions 104 and act as guides for rotary movement of the toe. See Figs. 5, 6 and 8. Depressions 104 and protuberances 106 are formed with common radii, and such that when assembled together the axis of rotation of toe 100 is always substantially in a plane perpendicular to the cam shaft. The length of arc bounding depressions 104 is made less than that bounding protuberances 106, and faces 108, 110 on toe 100 respectively opposed to faces 112, 114 on toe support 62 are flared back in each instance as shown, to permit rotation of the toe in the manner described. To provide for firm interlocking of the toe and toe support to retain the toe in adjusted position, the latter is provided with a tongue 116 shaped and arranged to slidably fit a recess 118 provided in the toe support 62. Tongue 116 terminates in a wide end 120 in which is provided an arcuate hole 122. Toe support 62 is provided with a lug 124 formed as an extension of abutment 70 and arranged with a lower surface (Fig. 6) flush with the upper wall of recess 118. This surface and the wall are adapted to engage the upper surface of tongue 116. Lug 124 has a hole 126 therein so spaced and arranged as to be in alignment with arcuate hole 122 of tongue 116 when the toe and toe support are in assembled relation. A bolt 128 having an associated nut 130 passes through holes 122 and 126 and is employed to lock toe 100 to toe support 62 in an obvious manner. It is evident that the coacting surfaces of depressions 104 and protuberances 106 serve to bear substantially all of the force exerted by the toe upon the pick ball; and as a consequence those surfaces should be made as extensive as is practicable.

It is evident that after the hub of the cam has been secured on the cam shaft lengthwise of the latter and in approximately the proper circumferential position, toe support 62 may be adjusted along the periphery of the hub into precise location for proper timing of the cam, bolts 58, 60 tightened, and stop screw 54 brought into firm engagement with abutment 70. Thereafter toe 100 may be rotated into linear contact with the pick ball at the desired point along the cam face section 98, and nut 130 tightened on bolt 128 to secure the toe in proper position. Further it is evident that because of the nature of the coacting surfaces of depressions 104 and protuberances 106, and because of the interaction of stop screw 54 and abutment 70, the several parts of the cam will perform their functions without slipping out of place under the repeated heavy impact loads transmitted from the cam shaft to the pick ball. It will be evident from an examination of Fig. 5 that the principal forces transmitted from the cam to the pick ball will be directed radially through protuberances 106. Since linear contact between cam surface and pick ball is secured at the critical area, the wear incident upon having non-linear or point contact between the pick ball and the pick cam will be eliminated.

Having disclosed a preferred embodiment of the invention it will be evident that modifications within the scope of the invention will occur to those skilled in the art, and what I claim and wish to secure by Letters Patent of the United States is:

1. In a loom having a cam shaft, a pick shaft, and a pick ball on the pick shaft, in combination therewith, a pick cam on said cam shaft in cooperative engagement with said pick ball for ac-

tuating the pick shaft; said cam comprising a hub, a plural-piece rim, and means securing said rim to said hub, said plural-piece rim comprising two relatively adjustable cam-face forming parts having mutually interengaging surfaces forming a pivot lying in a plane perpendicular to the axis of the cam shaft, and said cam further comprising means locking said two parts together in adjusted position.

2. In a loom, a cam shaft, a pick shaft, means supporting said shafts in planes substantially normal each to the other, a pick cam on said cam shaft, and a pick ball on said pick shaft and arranged to act as a follower on said pick cam; said pick cam comprising a rim including a toe forming a section of the cam surface and further comprising supporting and locking means for the toe, said toe and said support having interengaging faces providing pivotal adjustment of said toe relative to said support into linear contact with said pick ball and about an axis lying in a plane substantially normal to said cam shaft, and said locking means being arranged to lock said toe in adjusted position.

3. In a loom, a cam shaft, a pick shaft disposed generally transversely of the cam shaft, a pick cam on the cam shaft, and means including a pick ball on the pick shaft arranged as a cam follower for the pick cam; said pick ball being formed as a right conic section and arranged for rotation about the axis of said conic section; said pick cam comprising a plural-piece rim, a hub, and means securing the rim to the hub; at least one piece of said plural-piece rim having a cam face of distorted form providing at least a point contact with said pick ball and a second piece of said rim being provided with a cusp portion and means for adjusting and locking said second piece with said cusp portion in position for absolute linear contact with said pick ball.

4. A loom pick cam for imparting motion to a follower substantially radially of the cam comprising a hub, a disk portion and a toe support on said hub, a toe on said support, and means for securing said toe to said support and permitting adjustment thereof laterally of the plane of the cam disk, said adjusting and securing means comprising an arcuate protuberance on the support formed with its axis in a plane substantially normal to the axis of said hub, and an arcuate depression complementary to said protuberance but of smaller arcuate extent on said toe, and locking means for fixing said toe in an adjusted position laterally of the disk and support.

5. A loom pick cam comprising a hub, a rim, and means securing said rim to said hub and providing rotary adjustment of the rim about the hub; said rim further having a part comprising a toe support, a cam toe, and means including a pivotal bearing and an adjustable clamping means for adjustably interlockng said toe and said toe support, said bearing extending along the plane of the rim and providing relative pivotal adjustment of the toe with respect to the toe support about an axis lying in a plane substantially perpendicular to the axis of said hub and laterally of the effective movement imparted by the cam.

6. A loom pick cam for imparting motion to a follower substantially radially of the cam which comprises a hub, a disk portion and a toe removably attached to said disk portion, a bearing between said disk portion of the cam and the toe about which the toe may be rocked through a limited angular extent and in a direction transversely to the plane of the disk and to the plane in which the cam imparts motion to its follower, and means for locking said toe in an adjusted position.

7. A loom pick cam for imparting motion to a follower substantially radially of the cam which comprises a hub, a disk portion attached to said hub for adjustment peripherally of the hub and a toe removably attached to said disk portion and provided for adjustment laterally of the plane of the cam and of the movement imparted thereby to its follower, comprising a bearing between said disk portion of the cam and the toe formed as a projection and a complementary indentation on the respective parts, said indentation being of lesser extent than the projection thereby to permit limited angular movement of the toe, and means for locking said toe in an adjusted position.

8. A loom pick cam for imparting motion to a follower substantially radially of the cam which comprises a hub, a disk portion attached to said hub for adjustment peripherally of the hub and a toe removably attached to said disk portion and provided for adjustment laterally of the plane of the cam and of the movement imparted thereby to its follower comprising a bearing between said disk portion of the cam and the toe formed as a projection and a complementary indentation on the respective parts, said indentation being of lesser extent than the projection thereby to permit limited angular movement of the toe, and means comprising a projection from said toe and a corresponding abutment on the cam disk and clamping means between said projections for retaining them in an adjusted position.

9. A loom pick cam for imparting motion to a follower in a direction substantially radially of the cam which comprises a hub, a disk portion attached to said hub for peripheral adjustment relatively thereto and comprising articulated rim parts and a supporting part for a removably attached cam toe, a cam toe and means for connecting said cam toe to said disk portion and for providing lateral adjustment of the toe relatively to the plane of the disk and the plane of movement imparted by the cam to its follower thereby to align the active surface of the cam toe with the surface of the follower, comprising a bearing formed as an arcuate projection on one of the elements and a complementary arcuate indentation on the other, said indentation being of lesser extent as compared to the projection thereby to permit limited angular movement between the toe and the disk, and clamping means for locking the toe in a properly adjusted position comprising a slot in the disk and an abutment extending therefrom, a projecting lug formed as an integral part of the toe and aligned with said slot, and means for clamping the lug and abutment which includes a clamping bolt passing through an aperture in one of the elements and an elongated slot in the other.

10. In a loom, a cam shaft, a pick shaft disposed generally transversely of the cam shaft, a pick cam on the cam shaft and means including a pick follower on the pick shaft and aligned with the pick cam for movement in a direction generally radially of the said cam and its cam shaft, said follower having its transverse surface substantially linear to correspond to a cooperating linear surface on the cam, and means forming a part of said cam and designed to permit adjustment of a part at least of the cam to

assure complete linear engagement thereof transversely of the cam and along the length of the follower which comprises a pick cam hub and a rim extending from said hub, and a toe removably attached to said rim, a bearing between said disk portion of the cam and the said toe about which the toe may be rocked through a limited angular extent and in a direction transversely to the plane of the disk and to the plane in which the cam imparts motion to the said follower, and means for locking said toe in an adjusted position.

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