Ackerman steering mechanism pdf

27.4. The Ackermann Principle applied to Management 27.4.1. Ackermann's principle To achieve true rolling for a four-wheeled vehicle moving on a curved track, lines drawn across each of the four-wheel axles must intersect in the instantaneous center (Fig. 27.23). The actual position of the instantaneous center changes constantly due to the alternation of the angular positions of the front wheel to correct the trajectory of the steering vehicle. Since both rear wheels are fixed on the same axle, but the front wheel axles are independent of each other, instant centers are somewhere along an imaginary extended line drawn across the rear axle shaft. The Ackermann principle is based on the two front steering wheels that rotate at the ends of an axle beam. Ackermann's original linkage has a parallel set of track arms, so both rotated wheels rotate at equal angles. Therefore, intersecting projection lines are not at one point (Fig. 27.24.). If both front wheels are free to follow their own natural paths, they would converge and eventually cross each other. As the vehicle moves along a single middle road, both wheel tracks continuously conflict with each other causing tire slippage and tread exfoliation. The rear modified linkage uses sloping arms of the track rod so that the inner wheel rotates around its pivot slightly more than the outer wheel. Therefore, lines drawn through the auxiliary axis converge at a single point somewhere along the rear axle projection (Fig. 27.25). 27.24. Side pivot direction with parallel track rod arms. 27.25. Side pivot direction with sloping arms of the track bar. 27.4.2. The self-propelled motor vehicle almost from the beginning used the dual pivot wheel steering system. This was invented for horse-drawn vehicles in 1817 by George Lankensperger, a Munich tank builder. In England, Rudolph Ackermann acted as Lankensperger's agent and a patent for the dual-pivot steering agreement was taken on his behalf. With this linking arrangement, the arms of the track bar are placed parallel to each other and a track bar joins them together. In the straight forward position of the direction, the link and beam of the axis form a rectangle, but as the heel axes rotate around their king pins, the direction arrangement forms a parallelogram. This link configuration makes both wheels the same amount. Figure 27.26A illustrates the parallel assembly linkage positioned to provide a 20-degree, 40-degree turn for the indoor and outdoor wheels. Charles in 1878 he introduced an improvement in Ackermann's link design in which the sloping arms of the track bar form trapezium (Fig. 27.25). This trapezium link configuration allows the inner wheel to rotate around its king pin pivot in an amount greater than the outer wheel, which is required to provide semi-true rolling (Fig. 27.26B and C). The true bearing is obtained in the straight position and in the left and right turns (locks). Between these three positions, positions, partial true rolling occurs. The degree of output of the true rolling and, therefore, the amount of occurrence of the tire scrub depends mainly on the relationship between the track rod and the lengths of the track arm, and the angular inclination or arm assembly of the track rod, and the angular inclination or arm assembly of the track rod. In case the dimensions and settings of the steering linkage are carefully selected, there is very little misalignment for the angle of rotation up to about 15 degrees, beyond which the error increases rapidly. Also the link deviation of the actual rolling theoretical angles can be easily corrected by the flexibility of the sidewall of the tire and the distortion of the tread, provided that the angular error between the steering wheels is small. Because the rear wheels rotate in a smaller radius than the front wheels, it is easier to manoeuvre a vehicle in reverse than in the front direction when parked. 27.26. Ackermann link geometry. A. Parallel adjustment track rod arms, 20 and 40 degree rotated outer wheel. B. 10 degree set track-rod arms, 20 degree rotated outer wheel. C. 10 degree set track-rod arms, 40 degree rotated outer wheel. 27.4.3. Ackermann linkage geometry In the parallel adjustment steering arm design (Fig. 27.26A), the dimensions of the yi, xi andy0, x0 track rod remain the same for all angles of rotation. With the arms tilted (Fig. 27.26B and C), the dimension of the end of the yi inner wheel track bar is always smaller than the y0 dimension of the outer wheel, while negotiating a curve. On the other hand, there is very little variation between xi and x0 for small angular movements. For small steering angles over the king-pin up to 10 degrees, there is very little difference between yi and y0 and between the angles of rotation of the inner and outer wheel. Figure 27.26B illustrates that for a set of 10 degrees track bar arms if the outer wheel is rotated to 20 degrees, then the corresponding inner wheel is displayed to rotate 23 degrees. Similarly for the same assembly, for 40 degrees of outer rotation of the wheel, the inner wheel rotates 51 degrees (Fig. 27.26 C). Therefore, for a given angular movement of the heel axles, the inner wheel track bar arm and track bar are more effective than the outer wheel link when turning the steering wheel. For a certain amount of transverse movement of the track rod with inclined track rod arms, the less effective angular displacement of the heel shaft pivot occurs in the straight forward region, and the most effective angular displacement occurs as the heel shafts move away from the Average. Therefore, the angular movement of the inner wheel relative to the outer wheel becomes much larger as both wheels approach the movement of the inner wheel relative to the outer wheel becomes much larger as both wheels are completely blocked (Fig. 27.27). With modern radial tires, the difference between front and rear steering angles is sometimes reduced. 27.27. Front and rear locking steering angle curves. 27.28. Analytical solution diagram for Ackermann-linkage. Analytical solution. If the slight inclination of the track rod is neglected (Fig. 27.28), the movements of M and N in parallel direction to the PQ axis beam can be considered as the same, say z. Let M', N' represent the correct position of the direction and, r, denote the radius of the crossed arm. Example 27.2. A track has pivot pins of 1.37 m apart, the length of each track arm is 0.18 m and the track bar is behind the front axle and 1.27 m long. Determine the base of the wheel that will give a real roll for all wheels when the car is spinning so that the heel shaft of the inner wheel is 60o to the center line of the car. You can use a geometric construction. Example 27.3. The distance between the king-pins of a car is 1.3 m. The arms of the track while 0.1525 m long and the length of the track bar is 1.2 m. For a 1.42 m track and a 2.85 m wheel base, find the radius of curvature of the trajectory followed by the nearby side front wheel where you get the right direction when the car is turning right. 27.30. Graphical diagram of solutions for Ackermann-linkage. 27.31. Deviation of the outer wheels for the alleged deviation of the inner wheel. Therefore, for the graphical representation of the steering mechanism on a paper of reasonable size with a sufficient degree of precision, it can be assumed that the steering arms are of defined length and make a certain angle with the longitudinal axis of the vehicle. Now graphically determine the deviation on the outer wheel, <-> for various supposed deflection of the inner wheels, say 0, 10o, 15o, 20o, 25o, 30o, 35o, 40o and 45o for these steering arms as shown in Fig. 27.31. After knowing these values of 0, the corresponding angles 9 and $ are placed at opposite ends of line C as shown in Fig. 27.32. A curve is then drawn through the intersection of lines describing angle 9 and <j) correspondingly. The drawn curve is called a direction error curve, because its deviation from the true direction curve indicates the error in the direction angles. Angles 9 and the value corresponding to the intersection of these two curves determine the correct direction angle for a given a and c/b. Changing to for the same c/b results in another direction error curve. It can therefore be concluded that Fig. 27.32. Direction error curve. the most advantageous angle of the knuckles arms, i.e. depends on the turning range of the inner wheel. A kind of steering mechanism of Ackerman Technical field The invention belongs to the field Manufacturing technology for automotive parts, especially refer to a kind of steering mechanism of Ackerman. Background technology For the four-wheeled car, in the turning process, the front two-wheel turn should be different in theory, and the corner of the inlet wheel be older than outboard wheels. Casehistory, during left turnon, the corner of the nearby front wheel is greater than the front left corner; And this difference is not fixed value, but increases with the entire direction angle. If over the point of intersection of the axle line of the extended two-wheeled line flutters all the time on the rear axle axis, we affirm that this direction direction system is Ackermam (ackermann) rotary steering system (as shown in Figure 1). If it meets this condition, the vehicle will not take turns somatic Embryogenesis and will be tracked when turning, and steering effort is also minimal. This is the name with this theoretical presenter Rudolph Ackermann. Presenting all kinds of rotary steering systems are all dedicated to designing the steering hardware that satisfies Ackermam theory, but only an approximate result can be obtained, perhaps you can only get an ideal value in a certain way. Go back to your reason, the movement of the mouth (steering drop arm or toothbar) of the gear frame type steering motor, steering box of the circulation ball, turbine and worm steering box, etc., everything is a single movement today, straight line movement (toothbar), be exactly the circular movement (circulation ball , the turbine and the worm steering box) around the output shaft, therefore, cannot the total route satisfy Ackermam's theory. Summary of invention The objective of the invention is to propose a kind of Ackerman steering mechanism that can satisfy Ackermam's theory, to further reduce mill tires and steering force. The Ackerman steering mechanism of the present invention comprises the spindle arm, the right direction crossbar, the right direction crossbar, the left direction joint revolver is installed, the right wheel that saves the right direction is installed, and the left direction joint is described, the right direction joint are installed movably at both ends of the front axle by the bearing pin; The left end of the left direction crossbar described is connected to the left direction joint by the ball pin, and the right member of the right direction crossbar described is connected to the right direction joint by the ball pin; The left end of the right member of the left direction crossbar described, the right direction crossbar, the rear end of the spindle arm are rotating towards the ball pin to connect; The key is that the central part of the front axle described is fixed with a steering box housing, and the steering box housing described is fixed with an Ackermam lobe plate, and the Ackermam lobe plate described is provided with curved groove; The steering box housing described and the drill cavity bypass guide are being rotated towards the bearing pin to connect rotationally, and the spindle arm described passes the drilling cavity of the described detour guide guide, and the active front end card spindle arm accesses in the curved groove described; The described detour guide guide receives from the bearing circle rotate to the input afterwards, rotate and rotate the bearing pin, therefore force the spindle arm when rotating with the offset guide track, under the directional labeling of the curved groove, slide with respect to deflecting the guide track. The Ackerman steering mechanism mentioned above with the output movement of the traditional steering box by a single circular motion, synthesizing the movement of the plane that the circular motion combines with the movement in a straight line by cam + rotating shape, can perform in real time in the total route that throughout the steering procedure two wheel aleteos rotate to the desirable corner. The method of making the curved groove mentioned above comprises the steps: at first to change as input with revolver and right desirable steering angle to take turns, get the rotation to the trajectory curves of the ball pin, then turn to the ball pin path curves as input, along with the maximum rotation angle of the detour guide track , draw the curved groove shape. Specifically, the width of the curved slot described left-right symmetrical and curved is consistent. Because the entire process is reversible, so can the steering wheel completely, the curved groove it processes performs Ackermann's direction. In addition, the front end of the spindle arm described enters the curved groove described by the pin clamp. After long-term use, wear can appear on the pin, just change the pin right now and get the final product, and you don't need to change the entire spindle arm, thus reducing the cost of maintenance. In addition, the top surface of the described detour guide and the bottom surface are provided with exceptional cylinder, to form the described bearing pin that becomes. By using integrated bearing pin production and deflecting the guide, you can ensure the connection reliability of the bearing pin and deflect the guide. In addition, the diversion guide described is by turning towards the bearing pin, the speed reduction gear that will connect to the bearing circle, from the rotation of the bearing circle to the input action at the turn on the bearing pin, thus turning the track of the unit's bypass guide. The Ackerman steering mechanism of the present invention is simple in structure, adopts pure physical construction to control, so reliability is high, and you only need to change the corresponding Ackermam lobe plate for different types of cars and get the final product, and it is by portable force, has good practicality. Description of The Fig. 1 drawings is the drawing scheme of the Ackermam (Ackermann) steering principle. 2 is the integral drawing structure scheme of Ackerman's steering mechanism of the present invention. 3 is the Split-type structure scheme of Ackerman's invention. 4 is the cutting view of the local structure at the site of the diversion guide of Ackerman's steering mechanism of the present invention. 5, the 6th, the fundamental diagram of Ackerman's steering mechanism of the present invention (the arrow is stressed and the sense of movement between the figure). 7 is the structural curved groove representation of the Ackermam lobe plate. Indicate between the figure: spindle arm 1, Direction crossbar 2, right direction crossbar 3, Left steering joint 4, revolver 5, right steering joint 6, turn right 7, front axle 8, turn ball pin 9, steering box housing 10, Ackermam 11 lobe plate, curved groove 12, deflection guide track 13, turn bearing pin 14, Specific incarnation below contrasts Contrast drawing , by the description of the effect of the mutual alignment between the form of the specific realization of the present invention, such as each related member, structure, each part and annexation, each part and principle of work, etc. are described in more detail. Embed 1: As shown in the figure, the Ackerman steering mechanism of the current embodiment comprises spindle arm 1, the right direction crossbar 2, the right direction crossbar 3, be equipped with the left steering joint 4 revolver 5, the right of the right steering joint 6 will be installed turn 7 , left steering joint 4, right steering joint 6 are movedly installed at both ends of the front axle 8 by the bearing bolt; The left end of the left direction 2 crossbar is connected to the left direction joint 4 by ball pin, and the right member of the right direction crossbar 3 is connected to the right direction joint 6 by ball pin; The rear end of the left end of the right member of the left direction crossbar 2, right direction crossbar 3, spindle arm 1 is turning to ball pin 9 to connect. The center part of the front axle 8 is fixed with a steering box housing 10, and the steering box housing 10 is fixed with an Ackermam 11 lobe plate, and the Ackermam 11 lobe plate is equipped with curved groove 12; Steering box housing 10 and one have connection cavity bypass guide 13 turning to bearing pin 14 to be connected rotationally, turn to bearing pin 14 to be provided with exceptional cylinder for the top surface of the detour guide 13 and the bottom surface; Spindle arm 1 passes the drilling cavity of the bypass guide 13, and the front end of spindle arm 1 accesses in the curved slot described 12 by the active pin card; Have fun guide track 13 receive from the bearing circle turn to the entrance afterwards, rotate and rotate the bearing pin 14, therefore force the spindle arm 1 when rotating with the detour guide track 13, under the directional labeling of the curved groove 12, slide with respect to the detour guide track 13. The method to make the curved groove 12 mentioned above comprises the steps: at first to change as input with revolver 5 and to the right 7 the desirable steering angle of taking turns, get the turn to the trajectory curves of the ball pin 9, then it will turn to the trajectory curves of the ball pin 9 as input , along with the maximum rotation angle of the offset guide track 13 , draw the curved groove shape 12.Specifically, the width of the curved slot 12 symmetrical left-right and curve 12 is consistent. Because the whole process is also the steering wheel can do it completely, the curved slot 12 that processes performs the direction of Ackermann. When the vehicle stays straight, revolver 5 and rightly take turns 7 and are parallel to each other, pure rolling is advanced. (such as the left direction) the rotation of the chaufeur steering wheel has directly driven the guide from guide 13 by the gear of speed reduction when turning, deflecting guide track 13 rotates and rotates to bearing bolt 14, because there is a sliding block on the spindle arm 1 and deflect the guide guide 13, so spindle arm 1 also begins to rotate, and because of the front end of spindle arm 1 is connected in curved slot 12 of the Ackermam 11 lobe plate per pin, because the curved groove 12 each point away is returned to the distance of the bearing pin 14 differently, so the spindle arm 1 is when it rotates , slide along the detour guide 13 again, the result only for spindle arm 1 both along with the detour guide 13 rotates, do back simultaneously straight line movement, the resulting movement of the two is only for you to rotate the ball pin 9 to make the plane move , pulling the crossbar of the left direction 2, the right direction 3 crossbar, finally force the articulation of the left direction 4, the right direction joint 6 is around the rotation of the end pin separately, and so that the steering angle of revolver 5 rotates 7 more than to the right , thus conducting Ackermann's direction. 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