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FLAT TRACK TEST STAND WITH SIMPLIFIED AIR BEARING AND CORRECTION GEOMETRY FOR CORRECT MEASUREMENT OF ROLLING RESISTANCE

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Technical task:
The technical task of the invention is the correct measurement of the rolling resistance of tyres of a vehicle.

Initial situation:
When measuring the rolling resistance of tyres, it is of particular importance that the tyre contact surface is completely flat, i.e. that it does not show any curvature in the direction of travel or transversely to it. However, because it is mechanically easier to control, many tyre test stands are designed as so-called roller test stands. The tire rolls on another roller - typically with a large diameter. However, it is soon discovered that the measured rolling resistance depends on the diameter of the counter-roller. The smaller the diameter of the test stand roller, the higher the measured value. For measurements according to ISO standards, for example, a roller diameter of 2 m is specified and there is a correction formula for converting to infinite roller diameters. As an alternative measuring method for single tires there are also so-called inner drum test stands, where the tire to be measured is not placed on the outside but on the inside of the drum. The tyre contact surface is then no longer convex but concave and the measured rolling resistances are no longer too high but lower than on a flat contact surface.

Solution:
Due to the discussed measurement errors in roller test benches, the so-called flat track test bench with a flat tire contact area seems to be the ideal solution. With flat tracks, as known from wind tunnel technology for ground simulation, the flat track surface is sucked onto a perfectly flat bed via vacuum holes. If a tire with full wheel load is placed on such a flat track, special air bearings must be provided in this area to prevent excessive friction between the flat track belt and the bed. This means that there are partial areas from which air is blown out at high pressure, thus keeping the belt at a distance, and other partial areas where air is blown out to keep the belt flat. For this double task, there are complex constructions with correspondingly complex control systems.
If you now want to use a simpler flat track system where only one air bearing keeps the strip at a distance, you can still keep the surface reasonably flat by tensioning the strip. On closer inspection, however, the strip will be concave in the area of the wheel contact point. By analogy with the inner drum test rig, it can be concluded that such an arrangement, as with the inner drum test rig, will measure rolling resistances that are somewhat too low.
In order to retain the actual advantage of flat track measurement despite the simpler air bearing technology (namely the correct measurement of the rolling resistance without further correction), the bed contour can be modified so that the resulting flat track surface is somewhat flat again when locally loaded by a wheel. The so-called nozzle plate must therefore have a slightly convex shape so that the flat rolling surface is only created when the flat web is loaded. Since the deformation caused by the wheel contact surface is of course load-dependent, this can only ever be approximately correct. However, since real wheel loads only fluctuate within a limited range, the measuring error will be significantly reduced by the simplified air bearing as a result of the modification. The following claims are made on this test system:

Claim 1: Flat track with simple air bearing and convex deformed (instead of flat) nozzle plate
Claim 2: Flat web with adjustable convex deformed nozzle plate

Advantages:
- More accurate measurement of rolling resistance