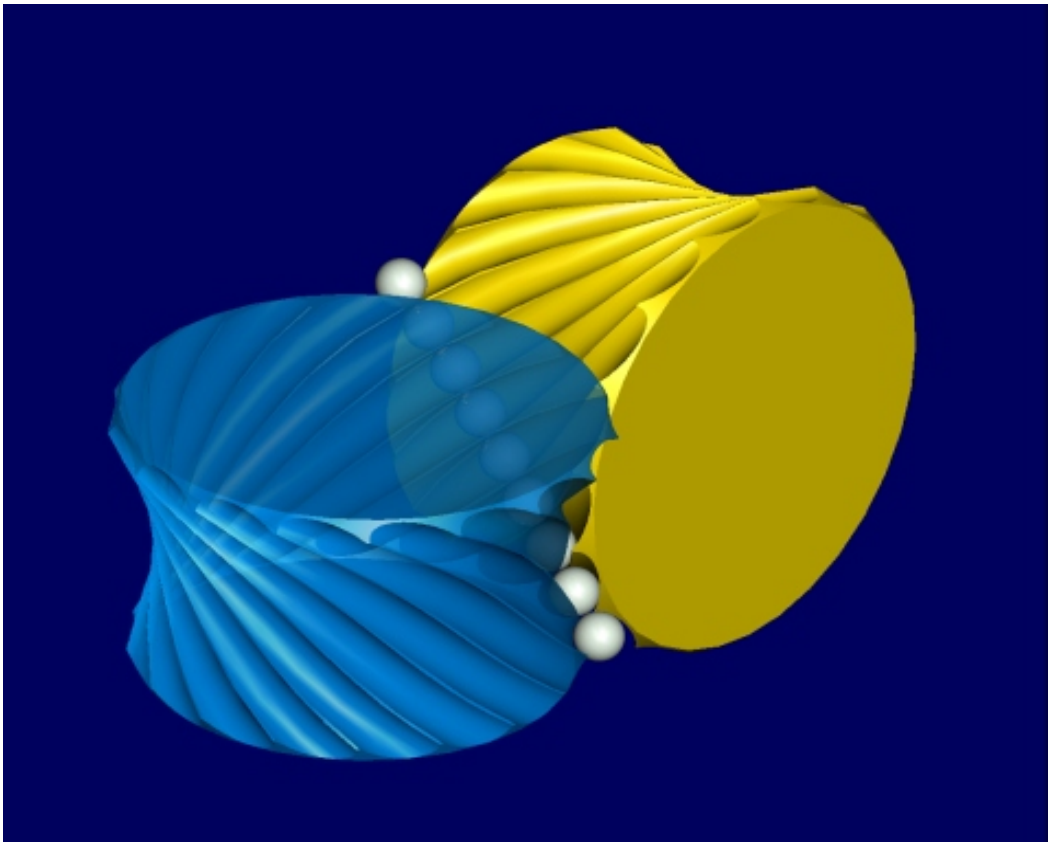
ROLLER GEARING



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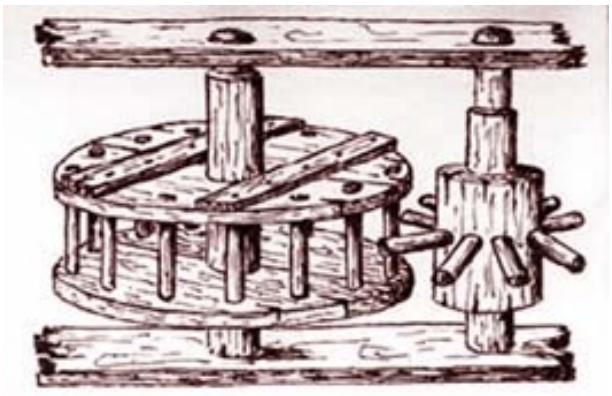
Mankind has been using cogwheel gear since old ages. For long, it was satisfactory to ensure that cogwheels do not stick during gearing, this was achieved through identical distribution of teeth and an interference-free tooth shape. Then the need emerged to keep the proportion of angle speed of the gearing wheels and the geared wheels during rotation. This can be performed through suitable tooth profiles (evolvent, cycloidal). However, the surfaces of teeth acting in the connection do slip onto each other, except when the connection point passes through the line connecting the axes of the two wheels.

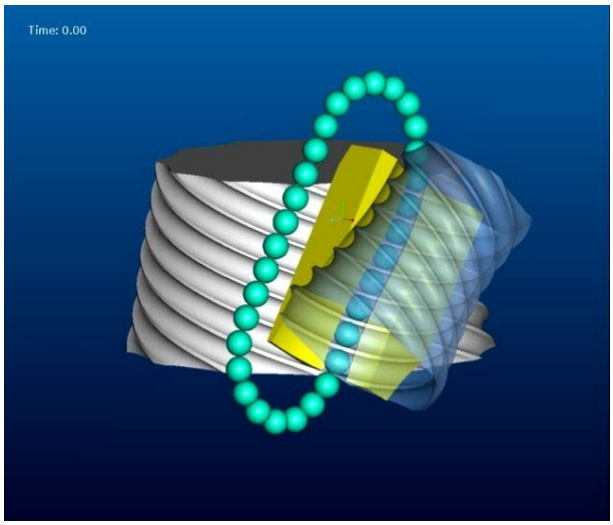


Furthermore, in case of helical wheels, worm wheels and worm gears, slip along the length of the teeth also occurs which worsens efficiency, causing warming and wear. Besides, the backlash of traditional cogwheel gearing can not be eliminated with a simple flexible tightening without the danger of seizure of wheels.

The question has been raised whether it is feasible to establish a connection based on clean rolling, closing with shape between bodies of revolution, simply through mediation of rolling bodies?

The solution lies in a mathematical model that has been created while rolling was taken into consideration.

With the help of this model, the geometry of gearing elements ensuring rolling connection can be calculated.



Input parameters: axis distance, the angle of axes, transmission, dimensions of the rolling element (ball, roller), the relative rotational directions, a point of the track of rolling element moving between the gearing element and the geared element, the direction of charge transmission.

The rolling elements move along a well-defined track (connection track) between the gearing body and the geared body, while rolling in their grooves. The rolling elements exiting the connection are driven back into the beginning of the connection track, where they re-enter between the gearing element and the geared element.

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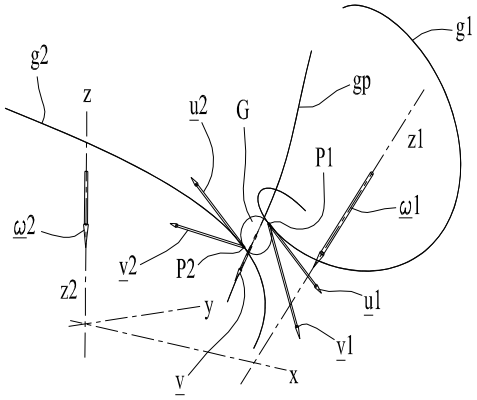
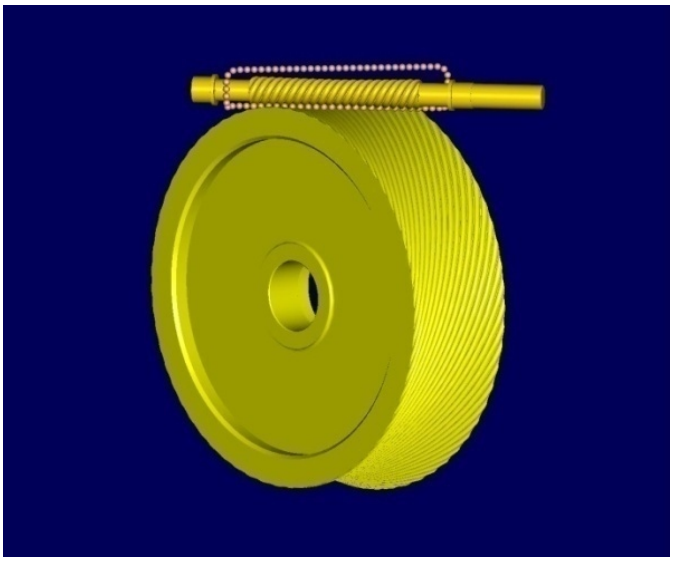
The creation of roller gearing starts with the solution of system of descriptive differential equations. Its result incorporates in the series of points providing the spatial track (gp) of the central point of the ball, its movement related to the gearing element and the geared element and the rolling curves (g1, g2).

Then the CAD model of the gearing can be established using the series of points, which is capable to support statics dimensioning. The method elaborated for dimensioning is based on Hertz theory. More precise results can be obtained with the help of finite element analysis.

The elements of dimensioned gearing can be manufactured on CNC machines. The delopment of production technology of roller gearing is in process in the areas of surface milling and ultra-precision lathing. With the former method, practically any groove surface can be processed, while with the latter method, the processing time can be reduced drastically.





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All torque transmission tasks can be solved using roller gearing:

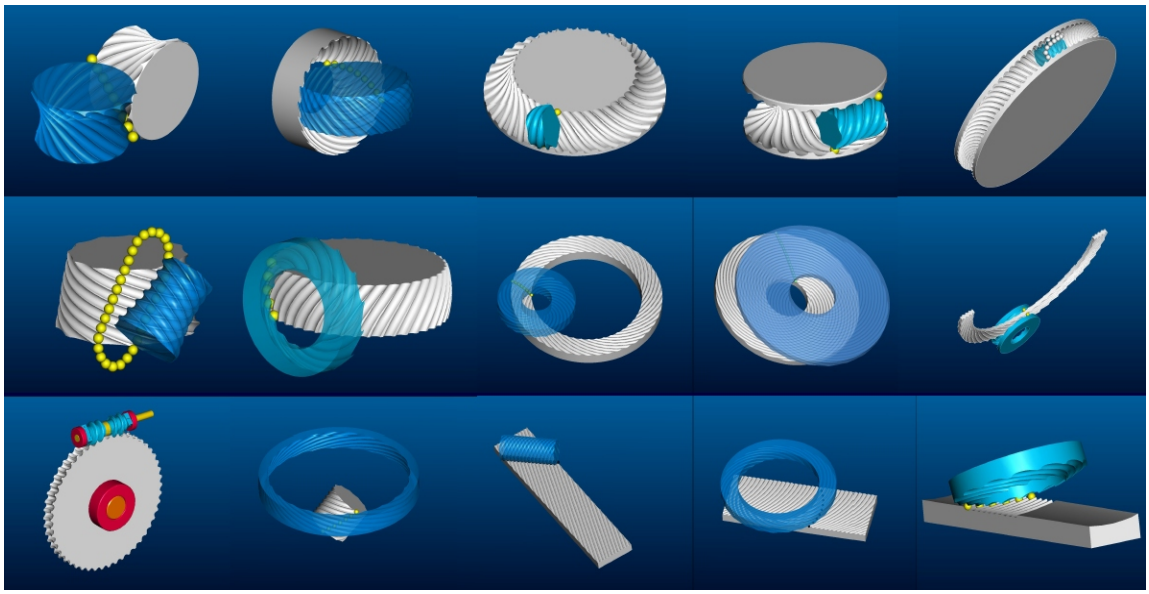
Rolling connection: between bodies of revolution, between body of revolution and gear rack and between gear racks
Placement of axes: parallel, perpendicular, skew lines
External groove system, internal groove system
Warm gear like drive with large transmission
Planetary gearing
Gearing with changing transmission

The essential features of roller gearing are the following:

Arbitrary placement of axes
High efficiency
Low starting torque
Large number of connecting balls (large number of connections)
Simple possibility to eliminate backlash
Flexibility: the dimensional proportion of the wheels is independent from the transmissional proportion
The relative rotational direction can be selected arbitrarily!

Application areas where roller gearing offers more advantages than traditional cogwheel gearing:

Gearing of skew axes
Where elimination of backslash is required
Smaller dimensions in case of larger transmissions
Acceleration drive engines
Exact gearings: due to large number of balls in the connection
Lubricant free drive engines: food industry, medicines industry
Drive engines operating at cold place



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