

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1.

A differential transmission for the transfer of power to driving wheels with a minimum resistive force to differentiation increased by, and in proportion to, the input torque, comprising, a driven housing having means for the attachment of a ring gear and axle openings in opposed sides of said housing, a recess to receive bevel side gears and pinion gears within said housing having, adjacent said axle openings, inwardly facing conical surfaces spaced from the axis of the housing outwardly to lie adjacent the outermost diameter of the recess relative to said axis and diverging toward the center of the housing, bevel side gears having inwardly facing teeth and conical extensions on the rear faces thereof to match and engage said conical surfaces whereby to form a friction developing means having a mechanical advantage, axle ends projecting into said axle openings, means on said side gears and means on said ends wherein said gears are slidably and rotatably mounted on said ends within the housing, pinion gears mounted between said side gears in mesh therewith, means to locate said pinion gears relative to said housing to permit the pinion gears to rotate but to cause them to revolve with said housing, and spring means mounted independently of said housing positioned to avoid contact with assembled axle ends within said housing exerting an equal and opposite predetermined bias on the inner faces of said side gears to force the conical extensions of said side gears into pressure contact with the conical surfaces of said housing to utilize the mechanical advantage thereof, the pitch line of said side

and pinion gears being disposed at an angle to utilize the axial thrust of the meshing teeth of said gears to supplement said spring means to increase the force applied to said friction developing means in proportion to the torque input to said transmission.

## 2.

A device as defined in claim 1 in which the means to locate said pinion gears comprises, a member having a circular recess centrally of said housing, and opposed pin extensions on said member extending through said pinion gears into said housing wherein said pinion gears may have rotatable movement on said pin extensions, said spring being positioned in the recess within said member.

## 3.

A differential transmission for the transfer of power to driving wheels with a minimum static resistive force to differentiation increased by and in proportion to the input torque comprising, a driven housing having means for the attachment of a ring gear and axle openings on opposed sides of said housing, a recess within said housing having, adjacent said axle openings, inwardly facing conical surfaces spaced from the axis of the housing outwardly to lie adjacent the outermost diameter of the recess relative to said axis and diverging toward the center of the housing, formed surfaces positioned in diametrical opposition to each other and lying on inner surfaces of said recess between said conical surfaces, bevel side gears having inwardly facing teeth on one face, a ring associated with each side gear having a conical outer surface and mounted to rotate with a side gear and engage said conical surfaces whereby to form a friction developing means having a mechanical advantage, said side gears being adapted to be rotatably and slidably

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mounted on axle ends projecting into said axle openings, pinion gears mounted between said side gears in mesh therewith, means to locate said pinion gears relative to said housing to permit the bevel gears to rotate but to cause them to revolve with said housing, the back face of said pinion gears being in running contact with said formed surfaces within said recess, and spring means mounted independently of said housing positioned to avoid contact with assembled axle ends within said housing exerting an equal and opposite predetermined bias on the inner faces of said side gears to force the conical extensions of said side gears into pressure contact with the conical surfaces of said housing to utilize the mechanical advantage thereof, the pitch line of said side and pinion gears being disposed at an angle to utilize the axial thrust of the meshing teeth of said gears to supplement said spring means to increase the force applied to said friction developing means in proportion to the torque input to said transmission.

4.

A device as defined in claim 3 in which the means to locate said pinion gears comprises, a member having a circular recess centrally of said housing, and opposed pin extensions on said member extending through said pinion gears into said housing wherein said pinion gears may have axial and rotatable movement on said pin extensions.

5.

In a differential wherein a driven housing is provided with a pair of opposed axle openings in one plane and a pair of opposed freely rotatable pinion gears mounted to revolve therewith in a second plane normal to said first plane, and one end of an axle shaft is adapted to extend through each of said openings, a side gear to be slidably and drivingly attached to axle shafts in mesh with each of said pinion gears, friction developing surfaces provided between inner walls of said housing and outer walls of said side gears spaced outwardly from the axis of the housing in the zone of revolution of the pinion gears to an extent to afford a mechanical advantage to outward axial forces on the side gears to permit differential action to be resisted, and dual means for effecting frictional resistance between said surfaces including spring means between said side gears positioned to be independent of axle shaft ends in said axle openings for continuously and constantly urging said surfaces into frictional relationship to provide effective initial resistance to differential action and to provide increasing of resistance effected by other means, and said pinion gears and side gears being meshed in a relationship to constitute said other means providing a component of tooth pressure force for urging said side gears axially outwardly to effect increased resistance to differential action in proportion to input torque at all speeds, said tooth pressure force being initiated by said spring means under no-load conditions at one axle and increased by the mechanical advantage of said friction developing means.

6.

A differential transmission for the transfer of power to driving wheels with a minimum resistive force to differentiation increased by and in proportion to the input torque, comprising, a driven housing having means for the attachment of a ring gear and provided with axle openings at opposed ends of said housing, a recess formed within said housing extending radially outward from the axis thereof, said axle openings being adapted to receive axle ends projecting into said recess, bevel side gears slidably and rotatably mountable on said ends within said housing adjacent the ends of said recess, pinion gears mounted between said side gears in mesh therewith located to rotate relative to and revolve with said housing, friction developing means associating said side gears and said housing radially in the zone away from the axle adjacent the outermost diameter and affording a mechanical advantage to outward axial forces on said side gears, spring means mounted to exert an equal and opposite predetermined bias on the inner faces of said side gears independently of said housing and said axle ends, whereby to apply pressure to said friction developing means to utilize the mechanical advantage thereof in resisting motion of said respective side gears, the pinion gears and side gears being meshed in a relationship to provide a component of tooth pressure for supplementally urging said side gears axially outward to increase the force applied to said friction developing means in proportion to input torque to said transmission at all speeds.