SAE International

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(R) One-Way Clutches - Nomenclature and Terminology

RATIONALE

This document has been revised for improved technical clarification, the addition of new types of One Way Clutches, and for the conversion from an “Information Report” to a “Recommended Practice”.

1. SCOPE

The definitions and illustrations in this SAE Recommended Practice are intended to establish common nomenclature and terminology for automotive transmission one-way clutches.

2. REFERENCES

There are no referenced publications specified herein.

3. DEFINITIONS

ONE WAY CLUTCH (OWC) - A self-actuating mechanical device used to transmit torque in one direction and permit free rotation in the opposite direction.

DRAG TORQUE - The torque required to turn the OWC in the freewheel direction.

4. MOST COMMONLY USED TYPES

4.1 Roller Clutch

A clutch having cylindrical elements which engage a cam profile on either the outer or inner race. This type of OWC relies on friction for proper engagement operation.

4.2 Sprag Clutch

A clutch having cam-profiled locking elements which engage cylindrical outer and inner races. This type of OWC relies on friction for proper engagement operation.

4.3 Pawl Clutch

A clutch having a pawl element engaging an axial or cylindrical raceway. This type of OWC relies on mechanical interlocking of the pawls for proper engagement operation.

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5. ROLLER CLUTCH

5.1 Nomenclature

5.1.1 Cam Profiled Race

That OWC race that contains the ramped profiles through which the rollers transmit torque.

5.1.1.1 Hook Type

A cam which has no legs, thereby forming "hooks" at the free wheeling end of the cam ramps. (See Figures 1, 2, and 4.)

5.1.1.2 Pedestal or Leg Type

A cam which has integral pedestals projecting into the space between the rollers to provide reaction for the springs and may provide concentricity control between the two races. (See Figure 3.)

5.1.2 Cylindrical Profiled Race

That OWC race providing the cylindrical surface through which the rollers transmit torque. (See Figures 1, 2, 3, and 4.)

5.1.3 Roller

The cylindrical locking element of the clutch. Several are usually used in each clutch. (See Figures 1, 2, 3, and 4.)

5.1.4 Energizing Spring

A spring used to position the roller into contact between the two races. (See Figures 1, 2, 3, and 4.)

5.1.5 Cage

An element used to contain the springs and rollers, and in concert with the springs, positions them circumferentially relative to the cam profiled race. (See Figure 2.)

5.1.6 Strut Angle

The angle between a line connecting the contact points of the roller at the cam profiled race and the cylindrical profiled race and a radial line from the roller center to either contact point. (See Figures 1 and 4.)

5.1.7 Cam or Locking Angle

The angle between lines drawn tangent to the cam profiled race and the cylindrical profiled race at the contact points of the roller (equal to twice the strut angle). (See Figures 1 and 4.)

5.2 Function Types

5.2.1 Spring Energized

A clutch which has the roller held in contact between the cam profiled race and the cylindrical race by individual springs or by means of a spring actuated cage or retainer.

5.2.2 Centrifugally Engaging

A clutch which has no spring mechanism for holding the roller in contact with the cam and race, but relies on centrifugal force to achieve engagement.

5.2.3 Centrifugally Disengaging

A clutch in which the rollers move out of contact with the inner race in over-running conditions, due to increasing centrifugal force.

5.3 Arrangements

5.3.1 Outer Cam Clutch

A roller clutch which has the cam profile surfaces on the outer race. (See Figures 1, 2, and 3.)

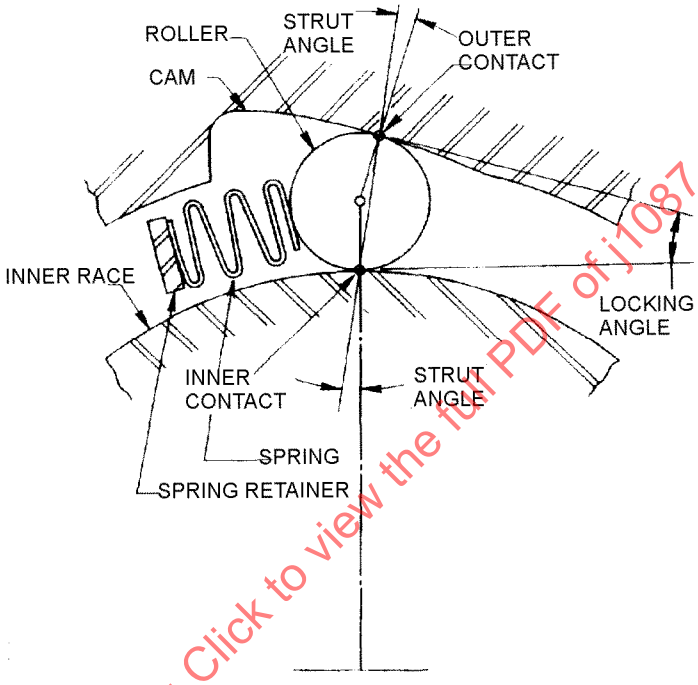

FIGURE 1 - OUTER CAM TYPE LOOSE ROLLER CLUTCH DIAGRAM

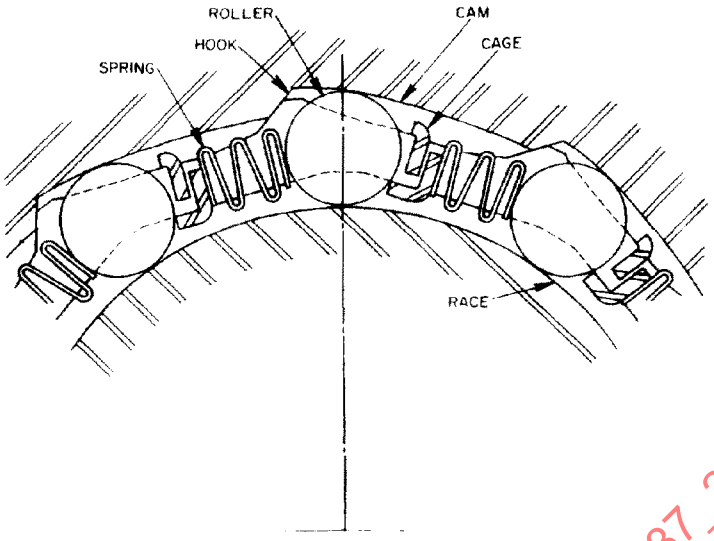

FIGURE 2 - CAGED ROLLER OUTER CAM TYPE CLUTCH DIAGRAM (HOOK TYPE CAM)

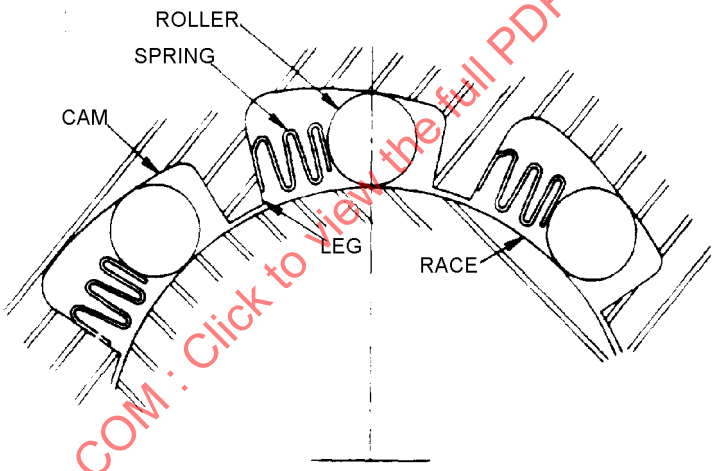

FIGURE 3 - LOOSE ROLLER TYPE CLUTCH DIAGRAM (PEDESTAL OR LEG TYPE CAM)

5.3.2 Inner Cam Clutch

A roller clutch which has the cam profile surfaces on the inner element. (See Figure 4.)

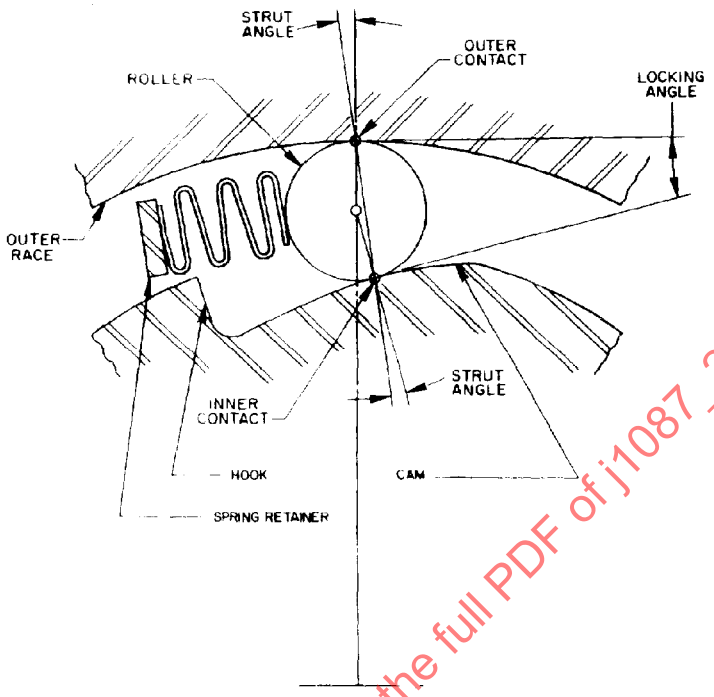

FIGURE 4 - INNER CAM TYPE ROLLER ONE-WAY CLUTCH DIAGRAM

5.3.3 Caged Roller Clutch

A roller clutch which has the rollers and springs contained as a unit. (See Figure 2.)

5.3.4 Loose Roller Clutch

A roller clutch which has the rollers individually placed between the cam and race, not located by a cage. (See Figures 1, 3, and 4.)

6. SPRAG CLUTCH

6.1 Nomenclature

6.1.1 Outer Race

That element which provides the outer cylindrical surface through which the sprags transmit torque. (See Figures 5, 6, 7, and 8.)

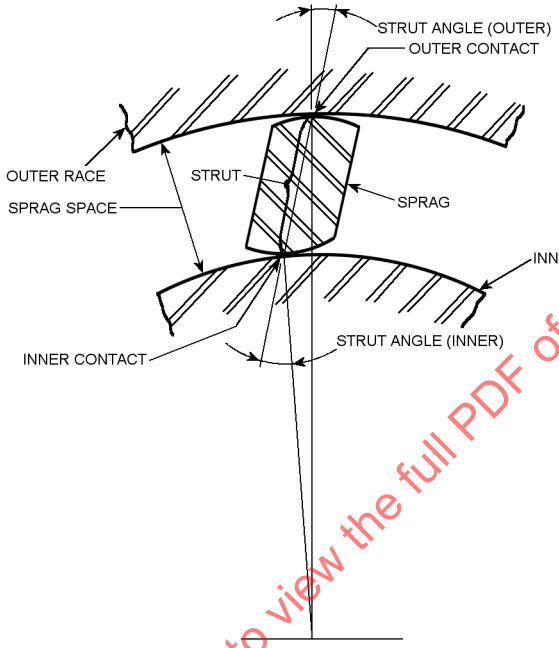

FIGURE 5 - SPRAG ONE-WAY CLUTCH DIAGRAM

6.1.2 Inner Race

That element which provides the inner cylindrical surface through which the sprags transmit torque. (See Figures 5, 6, 7, and 8.)

6.1.3 Sprag

The cam profiled locking element of the clutch. Several are usually used in each clutch. (See Figures 5, 6, 7, and 8.)

6.1.4 Energizing Spring

A spring used to actuate the sprags into contact with the inner and outer races. (See Figures 6, 7 and 8.)

6.1.5 Cage

One or more elements primarily used to contain and space the sprags. (See Figures 6 and 7.)

6.1.6 Drag Clip or Drag Strip

An element sometimes used to provide frictional drag between the cage and its adjacent race. (See Figure 6.)

6.1.7 Sprag Space

The radial distance between the inner and outer race cylindrical surfaces. (See Figure 5.)

6.1.8 Strut

The straight line connecting the inner and outer contact points. (See Figure 5.)

6.1.9 Strut Angle (Inner)

The angle between a radial line through the inner contact point and the strut. (See Figure 5.)

6.1.10 Strut Angle (Outer)

The angle between a radial line through the outer contact point and the strut. (See Figure 5.)

6.1.11 Inner Contact

The point of contact between the sprag and the inner race. (See Figure 5.)

6.1.12 Outer Contact

The point of contact between the sprag and the outer race. (See Figure 5.)

6.1.13 End Caps

Used to provide oil retention at the element interfaces and also provide minor concentricity control between the two races

6.2 Functional Types

6.2.1 Centrifugally Engaging

A clutch in which the sprags maintain contact, increasing sprag force with both races when acted upon by centrifugal force.

6.2.2 Centrifugally Disengaging

A clutch in which the sprags move out of contact, decreasing sprag force with the inner race when acted upon by centrifugal force.

6.3 Arrangements

6.3.1 Caged Sprag Clutch

A clutch that utilizes one or more cages to space or control the sprag elements. (See Figures 6 and 7.)

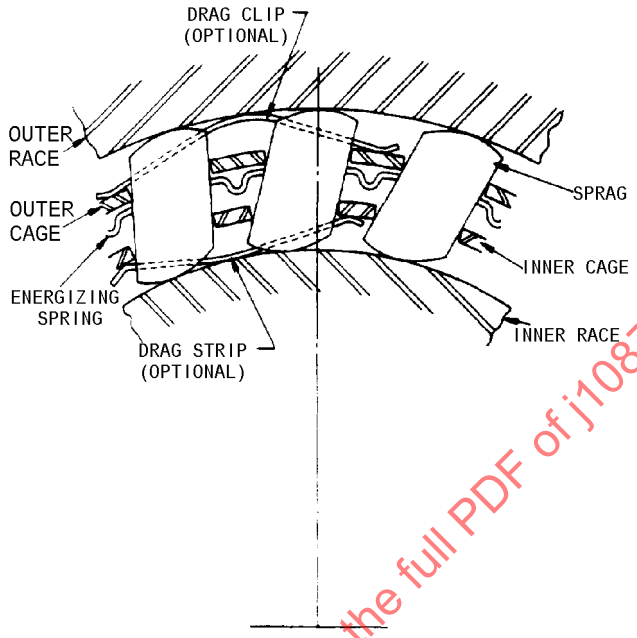

FIGURE 6 - TYPICAL DOUBLE-CAGE SPRAG ONE-WAY CLUTCH DIAGRAM

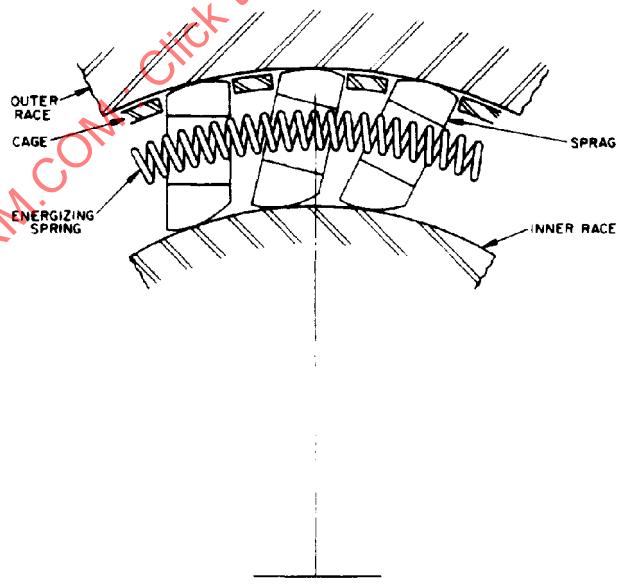

FIGURE 7 - TYPICAL SINGLE-CAGE ONE-WAY CLUTCH DIAGRAM