SAE INTERNATIONAL

SURFACE VEHICLE RECOMMENDED PRACTICE

J1087™ AUG2024

Issued 1974-05
Reaffirmed 2000-05
Revised 2024-08

Superseding J1087 JUL2019

One-Way Clutches - Nomenclature and Terminology

RATIONALE

Updated to add information to explain the Selectable OWC, where externally controlled selectable modes may include normal OWC operation in one or both directions, fully locked engagement, and/or fully disengaged freewheeling operation.

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 mechanical device used to transmit torque in at a minimum one direction and permit free rotation, or freewheeling, in at a minimum the opposite direction. Normal OWCs are typically self-actuating, or passive, transmitting torque in one direction while freewheeling in the opposite direction, under spring or centrifugal forces. Selectable OWCs can be controlled by external actuators. OWCs are also known as freewheel clutches.

DRAG TORQUE: The torque required to turn the OWC in the freewheeling direction.

4. MOST COMMONLY USED TYPES

4.1 Roller Clutch

A clutch having cylindrical elements that engage radially on 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 that engage radially on cylindrical outer and inner races. This type of OWC relies on friction for proper engagement operation.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/J1087_202408/

4.3 Pawl or Strut Clutch

A clutch having pawl or strut-type element(s) engaging planar or radially positioned locking elements housed in an inner or outer raceway and axially on plates or radially on cylindrical raceways. This type of OWC relies on mechanical locking of the elements for proper engagement operation.

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 that has no legs, thereby forming “hooks” at the freewheeling end of the cam ramps. (See Figures 1, 2, and 4.)

5.1.1.2 Pedestal or Leg Type

A cam that 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.) All elements are designed to carry torque at the same time.

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

A component 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 that 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 that 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 that has the cam profile surfaces on the outer race. (See Figures 1, 2, and 3.)

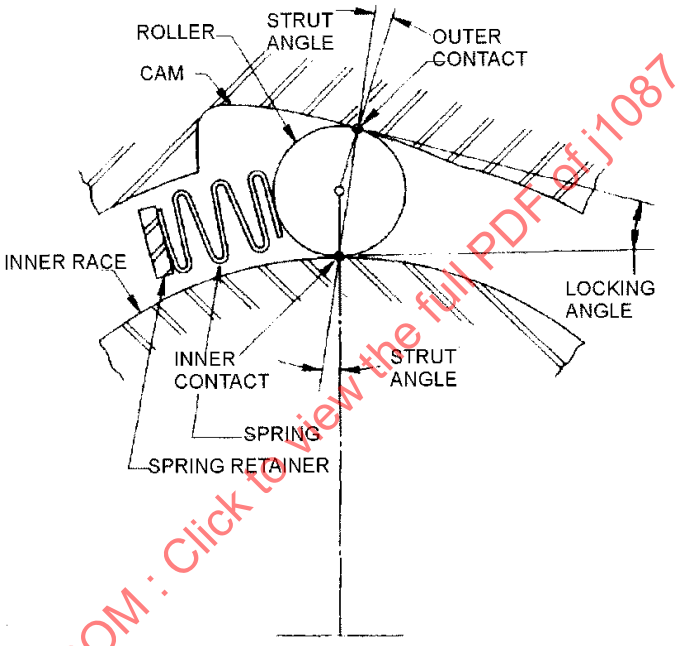

Figure 1 - Outer cam-type loose roller clutch diagram

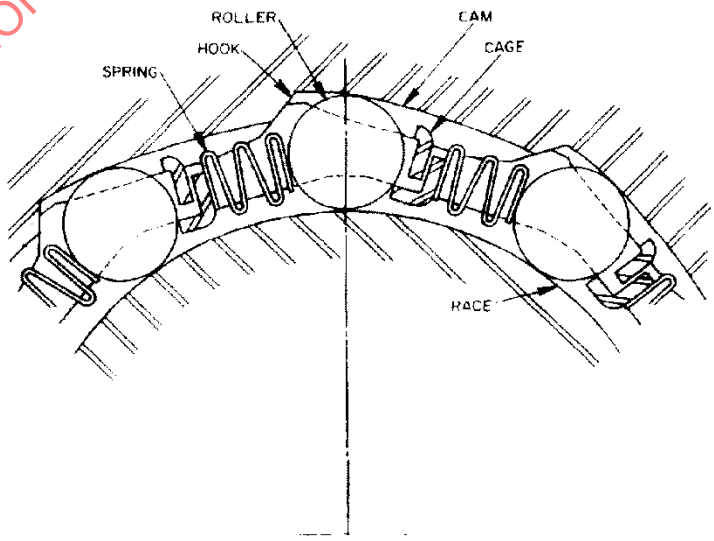

Figure 2 - Caged roller outer-type clutch diagram (hook-type cam)

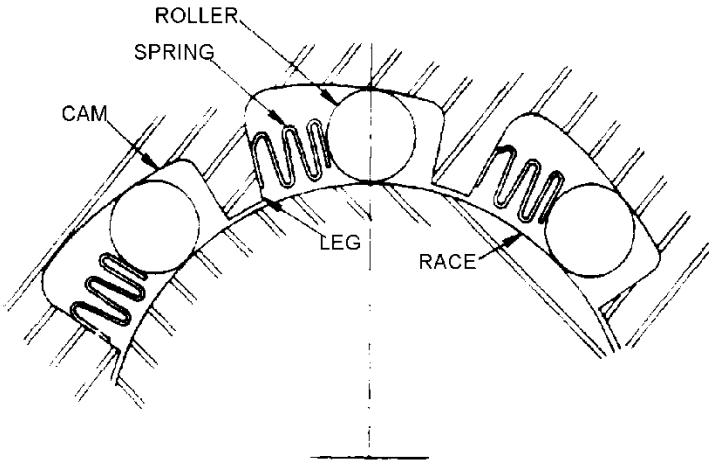

Figure 3 - Loose roller-type clutch diagram (pedestal or leg-type cam)

5.3.2 Inner Cam Clutch

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

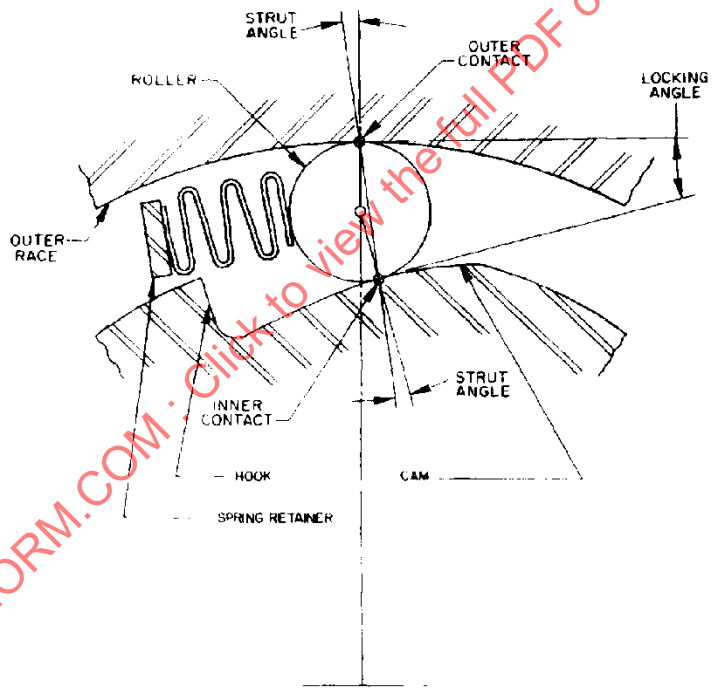

Figure 4 - Inner cam-type roller one-way clutch diagram

5.3.3 Caged Roller Clutch

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

5.3.4 Loose Roller Clutch

A roller clutch that 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 component which provides the outer cylindrical surface through which the sprag elements transmit torque. (See Figures 5, 6, 7, and 8.)

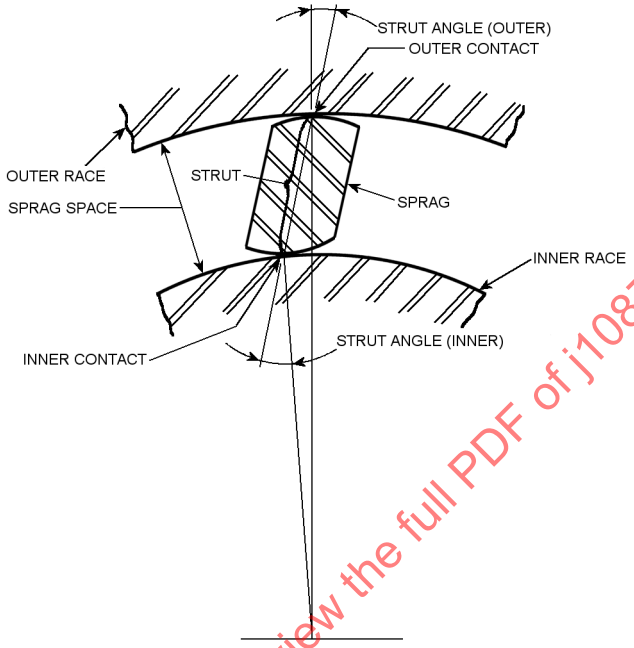

Figure 5 - Sprag one-way clutch diagram

6.1.2 Inner Race

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

6.1.3 Sprag Element

The cam-profiled locking element of the clutch. Several are usually used in each clutch. (See Figures 5, 6, 7, and 8.) All elements are designed to carry torque at the same time.

6.1.4 Energizing Spring

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

6.1.5 Cage

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

6.1.6 Drag Clip or Drag Strip

A component sometimes used to provide frictional drag between the cage and its adjacent race. (See Figure 6.) This keeps the cage(s), sprag elements, and springs rotating with the inner or outer race.

6.1.7 Sprag Space

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

6.1.8 Strut Line

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 line. (See Figure 5.)

6.1.10 Strut Angle (Outer)

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

6.1.11 Inner Contact

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

6.1.12 Outer Contact

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

6.1.13 End Caps

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

6.2 Functional Types

6.2.1 Centrifugally Engaging

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

6.2.2 Centrifugally Disengaging

A clutch in which the sprag elements 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.)

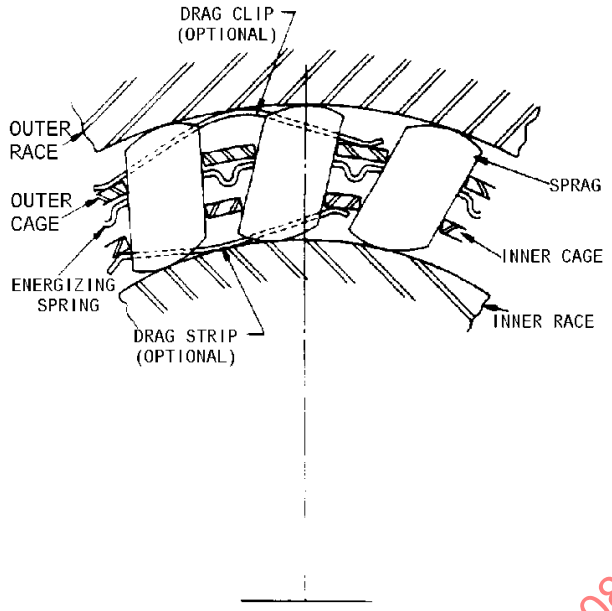

Figure 6 - Typical double-cage sprag one-way clutch diagram

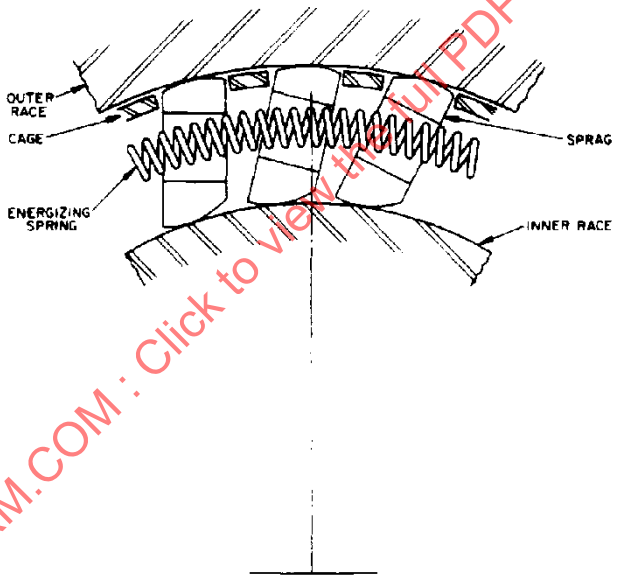

Figure 7 - Typical single-cage one-way clutch diagram

6.3.2 Full Complement Sprag Clutch

A clutch in which the sprag configuration provides circumferential spacing. (See Figure 8.)

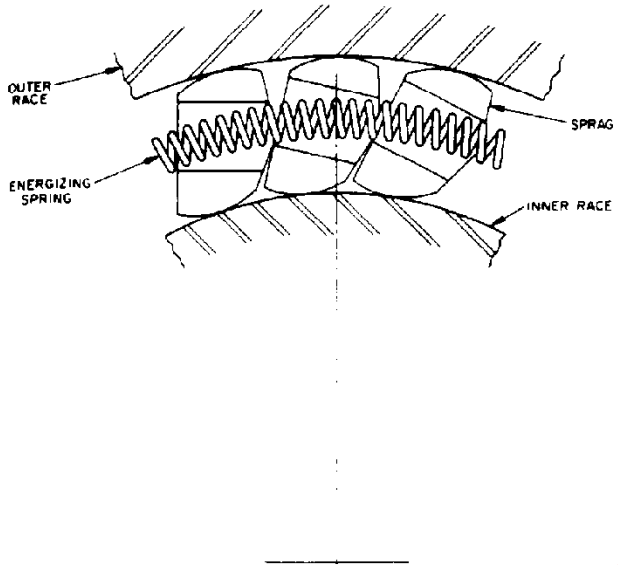

Figure 8 - Typical full complement sprag one-way clutch diagram

7. PAWL OR STRUT ONE-WAY CLUTCH (SEE FIGURES 9 AND 10)

7.1 Nomenclature

7.1.1 Pawl or Strut

The locking element of the clutch. Several are usually used in each clutch. One or more elements can carry torque at the same time.

7.1.2 Energizing Spring

The mechanism used to bias the element toward engagement with the notch plate or race.

7.1.3 Pocket Plate/Outer or Inner Race

The plate/race that provides a receptacle (pocket) for the elements and springs and provides the first loading surface against which the element transmits load.

7.1.4 Notch Plate/Outer or Inner Race

The plate/race that provides a notched surface with which the loading element engages.

7.1.5 Strut Line

The line of action defined by the contact points between the element and the two plates/races.

7.2 Functional Types

7.2.1 Centrifugally Engaging

A radially or planar placed locking element OWC in which the centrifugal forces acting on the locking element tend to move it toward engagement with the opposing race.