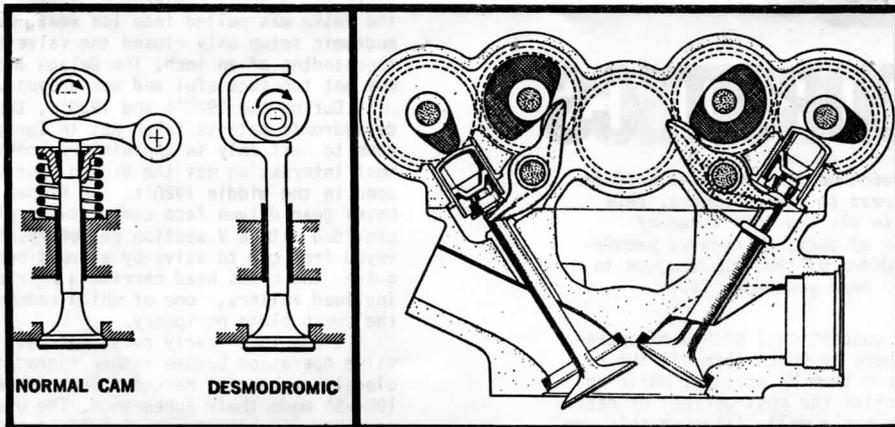


The Bigean-Sport desmodromic system was unique with its rotating swash plate and cross-head with rollers.

The Mercedes-Benz Grand Prix cars of the middle 1950s used this scissors action desmo setup with great success.



This drawing shows the normal cam-valve design on the left and a variation of the Delage desmodromic system on the right.

The Norton desmo design was simple and an improvement upon the Mercedes-Benz design. Norton already had the DOHC head on their famous "Manx" road racing single.

so that a comparison of friction losses could be made to the standard Manx engine. At a later stage of development, a set of cams were ground that provided much fiercer opening and closing rates, and this revealed a structural weakness in the vertical drive-shaft. Subsequently, the improvements to the vertical shaft were incorporated into the production Manx model, but the desmodromic setup was not. The designer had great hopes for his desmodromic head, but the company directors decided not to invest the money in the research that would have been necessary to make the unit race worthy.

The next milestone in desmodromics goes to the Ducati concern. This Italian company came into being in 1950, and in 1954 it decided that the best way to get world-wide publicity was to garner a world motorcycle racing championship. With this in mind, the company hired Ing. Fabio Taglioni, who subsequently designed what is probably the finest desmodromic engine the world has ever seen. The success of this engine is unique, considering that the tiny factory gave Taglioni only a meager budget to run a racing program on. The racing Desmo Ducati proved eminently successful, and today the Ducati is marketed all over the world.

The desmodromic engine was a 125cc unit, built in both single and twin cylinders, and the 22.5 HP at 14,000 RPM gave the twin cylinder engine the remarkable output of 180 HP per liter. The Ducati's desmodromic system was somewhat of a combination of the Mercedes and the Norton methods, with four rockers and four cams. The Ducati method did away with the Norton intermediate gear and utilized both closing cams on one wheel! This system made for an even more compact arrangement than on the Norton—an important factor on road racing motorcycles.

The engine design fully exploited all the desmo-

desmo advantages such as large valves, fierce opening and closing rates, and an extra 3,000 "over revs" of engine braking when going down through the gears while braking for a corner. An idiosyncrasy of the Ducati was the lack of compression at hand cranking speeds. This was because the valves were closed to within only .012 of an inch of their seats and engine compression closed the valves the rest of the way.

During 1958 and 1959 the works team had a grand run of successes, although, as a small factory, it could not afford to hire the best riders. Significantly, its greatest victories were on the faster tracks such as the Grand Prix of Sweden, Belgium, and Italy. By 1960 Ducati's racing program had gained the company what it wanted in way of publicity and expanded sales, and so the program was dropped.

The final step in the development of desmodromics occurred in 1967, when Ducati again began to race some prototype models with a completely new desmo design. In 1969 the new design made its debut on some of Ducati's sporting roadsters, which is a "first" in the history of motocycledom.

This new desmo Ducati had a design different from the older racing engines, which was necessitated both by the production cost factor and that notable lack of cranking speed compression in the racing version. In the new "D" model Ducatis the four cams are all located in the center of the head, with four rocker arms being used to actuate the valves. The new system also has a pair of low poundage hairpin valve springs to close the valves the final few thousandths of an inch onto their seats. This means that full compression pressure is available at cranking speeds, yet the safety factor inherent in a desmodromic system is retained. The new desmo setup thus appears to be simple, rugged, and produced at a cost factor very little above Ducati's standard single over-