

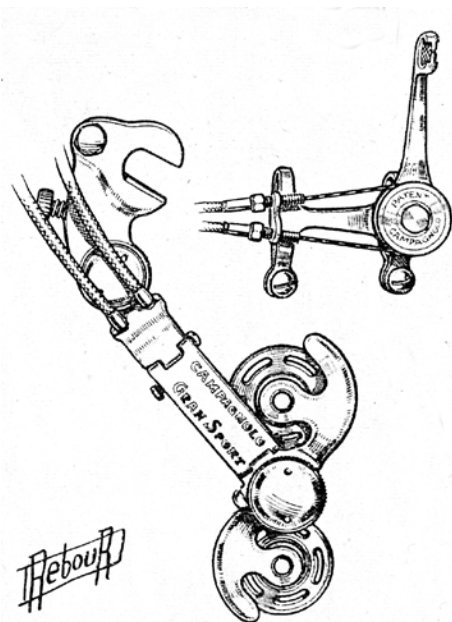
Developing the Campagnolo Gran Sport – the First Modern Racing Derailleur

by H. Ichikawa and Jan Heine

After decades of resistance, professional racing began adopting derailleurs in the late 1940s, with Simplex reigning supreme. In 1949, Italian superstar Fausto Coppi won both the Giro d'Italia and the Tour de France with Simplex derailleurs (albeit manufactured in Italy).¹ This may have prompted Tullio Campagnolo to develop his Gran Sport derailleur. The Gran Sport is significant because it is the first parallelogram derailleur developed for racing bikes. Almost every modern derailleur works on the same principle, and even looks remarkably similar. Here we examine the development of the Gran Sport derailleur.

1949: "Two-cable" version

Daniel Rebour reports that this derailleur was shown at the Salon de Milan (Milan Bicycle Show) in the fall of 1949 (Fig. 1). He wrote: "We noted with surprise that Campagnolo had placed, among his collection of components, a French-style derailleur. We may be wrong, but we were under the impression that Campagnolo was staking out a position rather than presenting an actual product."²



◁
Fig. 1:
The first
Gran
Sport
derailleur,
without
return
spring
and limit
screws.
For
photos
of this
derailleur,
see p.
7. (From
Le Cycle,
12/17,
1949)

This first version has no return spring, but instead a continuous cable, looped around the shift lever. One cable end pulls the derailleur to a bigger cog, the other to a smaller cog. It appears there are no limit screws to adjust how far the derailleur swings. With the Nivex derailleur, the limit stops were built into the shift lever. No photos of this derailleur in use are known. If anybody knows of a surviving Campagnolo two-wire derailleur, please contact the editor.

1950/51: First production versions

The first production version (51-1), introduced in 1950,³ is very different from the 1949 "two-cable" version. It already resembles the final version that survived, in modified form, as the Nuovo Record until the 1980s. During 1950/51, at least three versions were made as Campagnolo continued to improve the design. We labeled them 51-1 through 51-3, but these were not official Campagnolo designations.

Figure 2 shows the first known version (51-1). The clamp for the derailleur cable swivels to allow the optimum angle for the cable. This was done on all 1950/51 Gran Sport rear derailleurs. With the cable attachment so close to the exit of the cable housing stop, Tullio Campagnolo probably was afraid that a derailleur cable bent at the cable clamp might break. You also see an "additional" screw that is absent from all later Gran Sport derailleurs, near the upper pivot. It limits how far forward



△ Fig. 2: The first production model (51-1) of the Gran Sport derailleur was much modified from the prototype. A return spring simplifies installation (with only one cable). Limit screws facilitate setup. The numerous adjustment screws were simplified over time.



Fig. 3: Detail of the Gran Sport 51-1: The cable clamp bolt swivels to prevent bending the cable. The "additional" screw adjusts how far the derailleur can swing.



Fig. 4: The "additional" screw limits the derailleur swing (51-1). The oblong hole holds the end of the return spring.

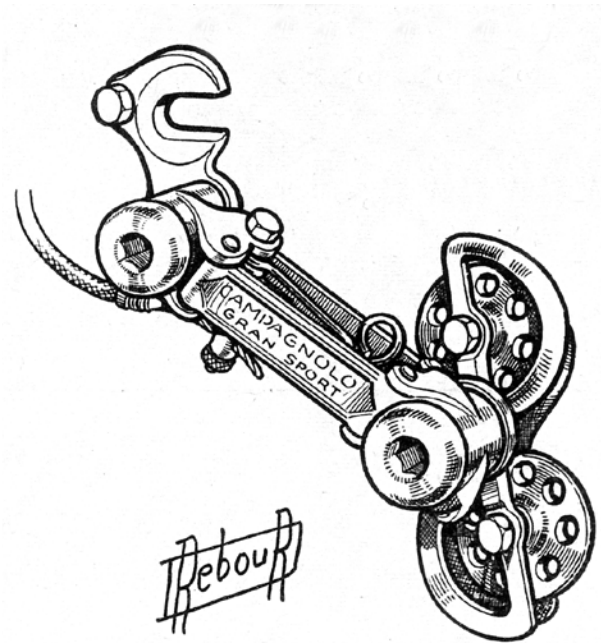


Fig. 6: "The CAMPAGNOLO 'Gran Sport' derailleur with lateral movement through a deformable parallelogram." (This is version 51-2, Le Cycle 12/23/1950)



Fig. 5: Reinforcement rib found only on 51 models.



Fig. 7: Model 51-3 (shown) is identical to 51-2, except for different screws and bolts. The "additional" screw is gone.



Fig. 8: The extra-large pulley cage was used only in 1952. The parallelogram geometry has been finalized already. (Model 52-1)



Fig. 9: Model 52-1: The plates were domed and angled instead of parallel, to make them stiffer. The rib has been deleted.

the derailleur can swing (Fig. 3, 4), thereby adjusting the angle of the derailleur. On later models, the angle of the derailleur was fixed. This early version only works with its proper, forged hanger (much nicer than later stamped versions). It does not fit on the dropouts with the built-in hanger that later became standard. Clearly, this first Gran Sport was intended to retrofit existing bikes. Both front and rear plates are made from brass. They are parallel and flat, not domed like later versions. These plates are prone to bending, despite a deep reinforcement rib on the rear of the front plate (Fig. 5).

The second version (51-2), introduced in late 1950, no longer has the screw to adjust the derailleur angle (Fig. 6). For the third version (51-3), Campagnolo replaced the knurled cable clamping piece with a simpler arrangement (Fig. 7), in addition to a few other minor changes. However, the bodies of versions 51-2 and 51-3 are the same.

All 1950/1951 models have ball bearing pulleys with 30 mm diameter and 9 holes. The early pulley material wears quickly. Only the pulleys without holes used for the "standard production" models, starting in 1953, were made of a harder material.

1952: Further refinements

Around June 1952, Tullio Campagnolo introduced the "Extra" model (52-1, Fig. 8).⁴ The attachment bolt has moved downward, more toward the center of the derailleur (Fig. 10). This means that the cable

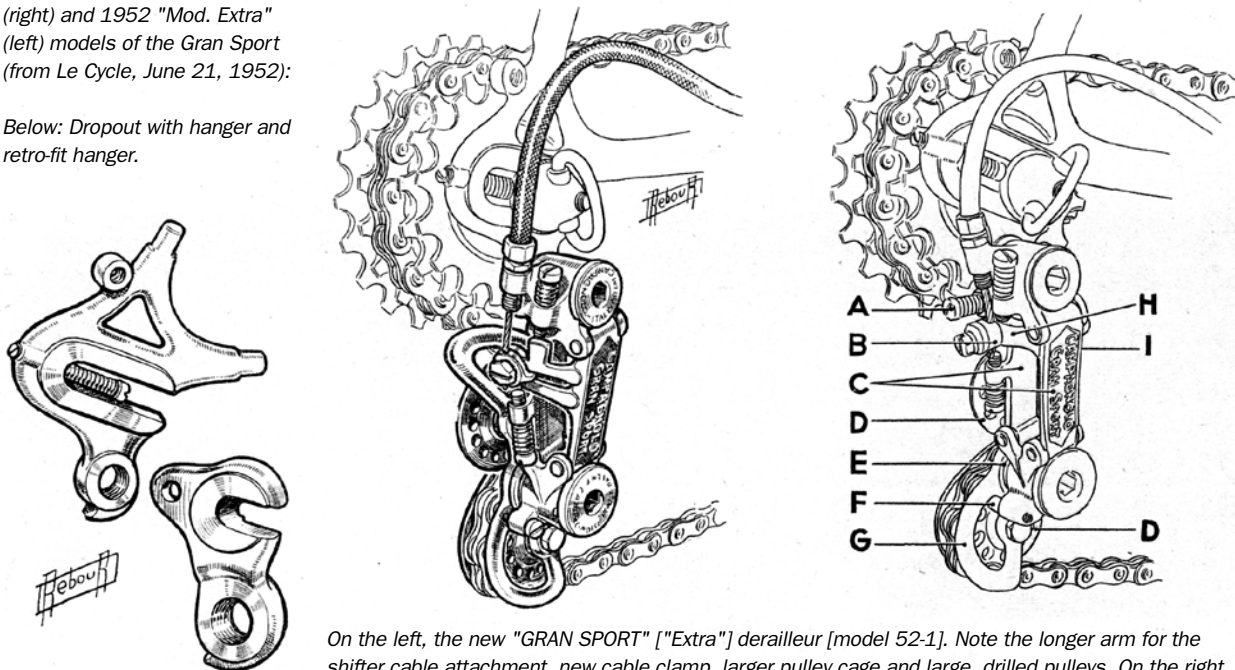
angle does not change as much as before when the derailleur shifts through the gears. The derailleur cable attachment does not need to swivel any longer. It now is the standard arrangement used for several decades. Since this new placement of the cable anchor bolt requires more cable pull to achieve the same derailleur movement, the barrel diameter of the shift levers was increased to compensate partially. But shifts now require more lever movement "to prevent accidental shifting over two cogs instead of one."⁵

To make the plates sturdier, they are slightly domed, made from steel, and they are not parallel (Fig. 9). The reinforcement rib has been deleted. The return spring is stronger, from thicker gauge steel, and with six windings instead of five. The chain tension now can be adjusted: The user can choose between six holes for the end of the spring. The screw that limits the swing of the pulley cage now is accessible from the outside, rather than the inside of the derailleur. The pulleys are larger, and the pulley cage has been greatly enlarged "to facilitate shifting over a large range of freewheel cog sizes."⁶ The large cage further limited the capacity of the derailleur: If the cage swung upward, it must have interfered with the freewheel cogs.

In late 1952, a new, significantly domed rear plate appeared on model 52-2. The elongated hole that located the end of the return spring was deleted. This rear plate is the same as on the 1953 version.

Fig. 10: Comparing the 1951 (right) and 1952 "Mod. Extra" (left) models of the Gran Sport (from *Le Cycle*, June 21, 1952):

Below: Dropout with hanger and retro-fit hanger.



On the left, the new "GRAN SPORT" ["Extra"] derailleur [model 52-1]. Note the longer arm for the shifter cable attachment, new cable clamp, larger pulley cage and large, drilled pulleys. On the right, the old model [51-1], with the changes as shown:

- A: Screw for adjusting derailleur angle deleted.
- B: Cable clamp with hole replaced by pinch bolt [and groove].
- C: Parts made from aluminum bronze replaced with stamped [cast?] steel.
- D: 30 mm pulleys with 1/8" balls replaced with 35 mm pulleys with 5/32" balls.
- E: Now 6 holes for the end of the chain tension spring [to adjust chain tension].
- F: Limit screw for pulley movement easily removeable.
- G: Outer flange [of pulley cage] extended on top.
- H: Arm for shifter cable attachment is 5 mm longer
- I: Spring for lateral movement (invisible in the drawing) much stronger and more supple.

1952 models usually have pulleys with 16 holes, but pulleys with 12 holes (for the 52-1 model) also appear to have been made.

1953: Standard production model

The standard production model was introduced in 1953 (Fig. 11, 12). It incorporates several further changes, most notable the recessed, smaller pivot bolts, which now are black instead of chrome-plated as on the earlier models. The front plate is domed more than in the past. The pulleys no longer have holes. The pulley cage reverted to a smaller model.

Over the years, further detail changes were made, such as the deletion of the cable adjuster screw (around 1960) and a thicker bottom spring cover to move the cage inward to accommodate 6-speed freewheels (1961),⁷ but the basic design remained unchanged.

The basic design lived on with the Nuovo and Super Record derail-leurs (with aluminum bodies) through the mid-1980s.

Notes:

- 1 Italian Simplex catalog, 1950.
- 2 Le Cycle, December 17, 1949, p. 8.
- 3 Le Cycle, December 23, 1950, p. 16-17.
- 4 Le Cycle, June 21, 1952, p. 22.
- 5, 6 Ibid.
- 7 Schmidt, Chuck, Campagnolo Timeline, www.velo-retro.com (status 11/13/2003)

This article was reviewed by Tony Beckett, Campagnolo marque enthusiast at the Vintage Cycle Club, and Chuck Schmidt, whose comments were very helpful. The photos for this article are by H. Ichikawa.

In addition to the developments charted in this article, there were many detail changes: See H. Ichikawa's web site:

<http://www1.ocn.ne.jp/~campa/>

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Fig. 11: The standard production model was introduced in 1953.

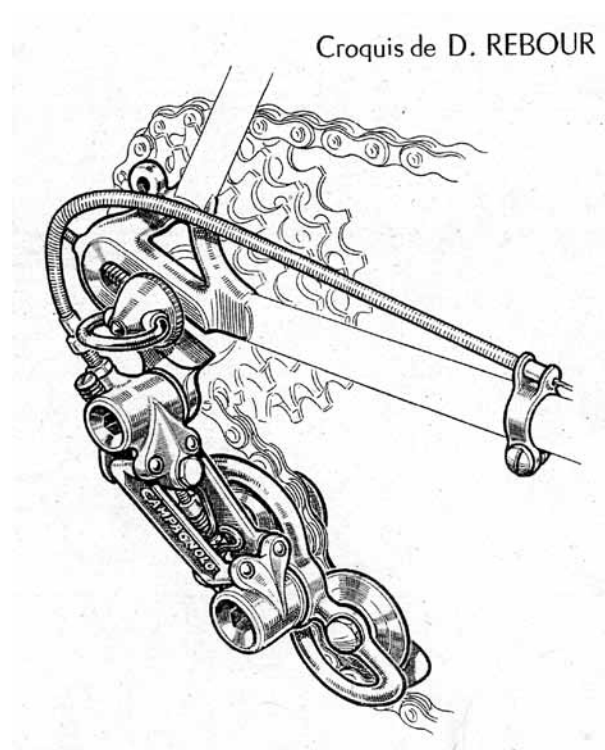


Fig. 12: "The new CAMPAGNOLO derailleur (smaller chain guide, pulleys without holes) was used by the Italian team" (Le Cycle, August 8, 1953, p. 14).

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Milestones in the Development of Parallelogram Rear Derailleurs

by Jan Heine

The story of derailleur development from the very beginning has been told elsewhere.¹ Instead of duplicating that work, this article focuses on the development of the parallelogram derailleur, and especially on the orientation of the parallelogram.

Nivex: The first production parallelogram derailleur

The French Nivex derailleur was developed by P. Gardini, G. Trottier and R. Déchanet. It was patented in various European countries in 1937,² and entered production in 1938.³ The Nivex was the first parallelogram derailleur that sold in significant numbers. Made from stamped steel, it is not very pretty, but it works very well. This is no accident, but the result of careful design that was decades ahead of the competition: The parallelogram is mounted on the chainstay. It moves the upper pulley away from the rear axle as it swings toward bigger cogs, "keeping the chain always at the most favorable distance to the freewheel cogs."⁴ The pulley follows the contour of the freewheel, ensuring what Frank Berto called the "key design feature [...] of a fairly constant chain gap"⁵ [distance between pulley and freewheel cog]. The cage pivots around the upper pulley axle, so front shifts do not affect the position of the upper pulley in relation to the freewheel, even with the then-common 48-32 chainrings. A clever lever arm keeps the chain tension constant, whether the chain is on the big or small chainring. This is especially useful with small front chainrings, where chain tension of conventional derailleurs often is insufficient to keep the chain from hitting the chainstay. From my experience, the Nivex shifts extremely fast and positively,⁶ as well or better than most modern derailleurs. Without a return spring, there is very little resistance, making for very smooth shifts. The Nivex works well even on 5- and 6-speed freewheels.

A few French cyclotouring bicycles used the Nivex in the 1940s and 1950s, especially those made by Alex Singer, who filed and chrome-plated the basic derailleur to beautify it.⁷ Unfortunately, Nivex lacked the financial resources to advertise their derailleur widely, so it remained relatively unknown.⁸ Production continued into the 1950s, then the French constructeur Dujardin bought the remaining parts



Nivex cyclotouring derailleur (1962 Singer randonneur). The dropout incorporates a chainrest to facilitate wheel removal. The two shifter cables exit on the right.

and assembled additional units until 1968.⁹

Campagnolo Gran Sport: A copy of Nivex?

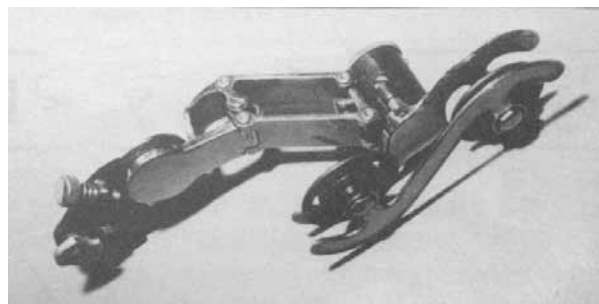
In 1949, it became obvious that time was running out for Campagnolo's cumbersome gear changers (Cambio Corsa and Paris-Roubaix models).¹⁰ Fausto Coppi won both the Giro d'Italia and the Tour de France using Simplex derailleurs.¹¹ Campagnolo had to think fast if he were to retain his place in the Italian racing world.

Ernest Csuka reports that at the "Salon de Paris" (Paris bike show) in 1949, a few months after the Tour, Tullio Campagnolo bought two Nivex derailleurs at the Alex Singer stand.¹² At the 1949 Milan bike show, D. Rebour noticed a new derailleur at the Campagnolo stand.¹³

The two-wire prototype shows how Tullio Campagnolo adapted the Nivex for use with racing bikes. With the Nivex and similar chainstay-mounted derailleurs, wheel removal is very difficult, because the chain wraps around the freewheel on three sides (which prevents chain skip and reduces freewheel wear). With the chain underneath the freewheel, the wheel cannot drop downward until the rider takes the chain off the cogs and wrestles it between the dropout and axle, a messy task at best. Nivex solved the problem with a chainrest and split axle, but this solution requires a rear axle cut off flush with the freewheel. Campagnolo's derailleur, on the other hand, had to work on any bike, not only on frames with custom chain rests. Furthermore, his quick release extended beyond the bike's dropouts, and thus would not clear the chain on a bike with a chainrest.

Campagnolo's solution was simple: He turned the derailleur by 90 degrees. Now the wheel could drop out to the bottom, aided by the moveable upper pivot. This pivot does not have any function when shifting (the derailleur body sits against the stop on the hanger – it really is a single-pivot derailleur), but it allows the user to swing the derailleur out of the way to let the wheel "drop out." The derailleur could be retrofitted

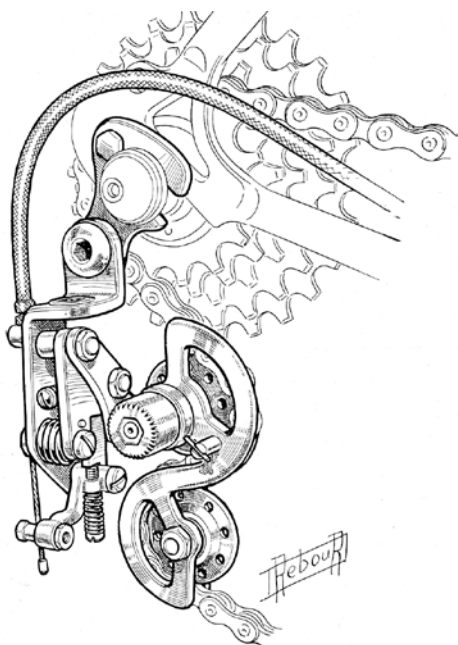
*Right and bottom:
The prototype
Campagnolo 2-wire
Gran Sport's short
parallelogram
exacerbated the
undesirable upward
movement of
the pulley as the
derailleur shifts to
a larger cog.*



easily on existing bikes with a hanger sandwiched on the rear dropout, rather than requiring a special braze-on.

Beyond the different mounting and cleaner appearance, the function of the first prototype was pure Nivex: A very long cable loops around the shift lever. Each end goes back to the derailleur. One end pulls the derailleur to a bigger cog, the other to a smaller one. No return spring is used. Some of the special features of the Nivex were discarded, such as the lever arm on the tension spring that provides near-constant chain tension. On contemporary racing bikes, the gear range was small,¹⁴ and thus the chain tension did not vary much.

But attaching the derailleur near the dropout was not the ideal solution: Where the Nivex follows the contour of the freewheel, the Gran Sport is hinged at the opposite end. So it moves closer to the rear



The Huret Allvit resembles a Nivex, only it is attached to a steel arm instead of the chainstay, and it has a return spring. (First version from *Le Cycliste* 11/1958)



Huret turned the Nivex parallelogram downward for the Allvit, combining the advantages of Campagnolo (easy wheel removal, easy set-up) and Nivex (constant chain gap). (Second version on 1960 René Herse racer).

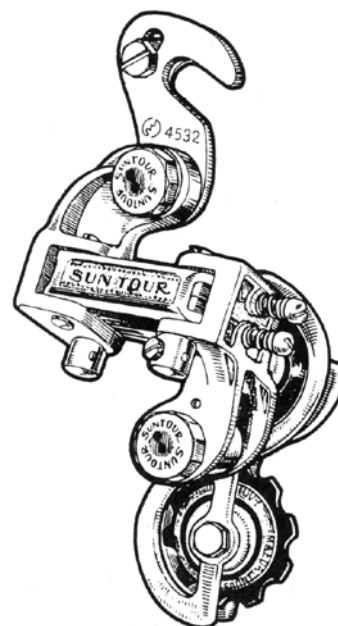
axle as it shifts to larger cogs.¹⁵ To keep the upper derailleur pulley out of the freewheel cogs, the derailleur has to be quite long. On the smaller freewheel cogs, the distance between cog and pulley is large, and the derailleur does not shift well onto these smaller cogs.

Campagnolo placed the pivot in the center of the pulley cage. The reason is unclear, maybe he considered the symmetric cage more beautiful. But this introduced another problem: With a front shift, the cage moves a lot, yet it takes up only very little chain slack. The location of the upper pulley in relation to the freewheel changes significantly. Then-current racing bikes rarely had more than 4 teeth difference between chainrings, but the Gran Sport was not suitable for cyclotouring bikes. In the 1963, when racers began to use 52-42 chainrings, Campagnolo moved the pivot closer to the upper pulley, so it could take up more chain slack (Record model).

Ghiggini's patent: Inspiration for the Gran Sport?

Around 1937, Francesco Ghiggini in Italy developed a "revolutionary" gear changer that allowed changing gears while pedaling forward, a variation of the Vittoria shifter with shifting "paddles" underneath the chain instead of above, and with what appears to have been an automatic chain tensioner.¹⁶ In 1941, Ghiggini patented another gear changer: a parallelogram derailleur, hinged from the dropout, with a single pulley, activated by a single cable and a return spring.¹⁷ In principle, it was similar to the later Campagnolo Sport. I do not know whether this derailleur ever was built. The story goes that in 1950 – after the presentation of the two-wire Campagnolo Gran Sport and perhaps even of the first single-wire model – Ghiggini complained that he had a patent for a parallelogram derailleur. Campagnolo bought the patent in late January 1951 for 500,000 lire, the equivalent price of a small apartment.¹⁸ If this story is correct, it appears that Ghiggini indeed "invented" a parallelogram derailleur a few years after the Nivex was marketed in France. However, Campagnolo seems to have been unaware of Ghiggini's work while he developed the first Gran Sport derailleur. When presented with the patent, he had little choice but

▷
By "twisting" the parallelogram, the Suntour slant parallelogram derailleur provided the function of the Huret Allvit without the ungainly steel arm. This Suntour V was introduced in 1969. (From Berto et al., ref. 1)



to buy it, so he could continue to make his new derailleur. However, Raymond Henry suggested that by buying Ghiggini's patent (perhaps for less than the reported sum), Campagnolo may have protected himself against future patent infringement claims from Nivex.¹⁹

The production Gran Sport: An original design

Within a year of the presentation of the first Gran Sport prototype, Campagnolo completely redesigned the derailleur. Only the parallelogram of the Nivex remained. A return spring replaced the looped cable, which made set-up much easier. Limit screws allowed fine-tuning how far the parallelogram could swing, further facilitating installation. To my knowledge, this is the first time limit screws were incorporated into a derailleur.²⁰ The next model (52) was further simplified. The grooved, open cable clamp eliminated the risk of splaying the cable when inserting it into the hole of the earlier clamp.

Despite its limitations, compared to the gear changing mechanisms used in Italy at the time, the Gran Sport shifted extremely fast and precise. It was rugged – apparently much more so than other racing derailleurs of the time²¹ – and easy to set up. Finally, it looked similar to the existing racing derailleurs, most notably the Simplex (also with an upper pivot, functional and spring-loaded in this case), which must have helped its acceptance in the conservative professional peloton. It soon became a great success among racers.

Huret Allvit: Re-reversing the parallelogram

Cyclotourists mostly stayed with the decades-old Cyclo,²² which shifted quite well over a wide range of gears, but the wheel removal problem persisted. Only a few of the most expensive bikes had a chain rest. Huret solved the problem with their Allvit, introduced in 1958.²³ Here, the parallelogram was hinged at the far end of the derailleur, similar to the Nivex. However, instead of attaching the derailleur to the chainstay, Huret provided a steel arm that extended downward from the dropout. As with the Campagnolo, the wheel could be removed downward with little interference from the chain. The Allvit works like a Nivex, but rotated 90 degrees downward. Similar to the Nivex, the upper pulley is coaxial with the cage pivot, so front changes have no effect on shifting performance. In addition to being oriented correctly, the parallelogram is angled to provide even more downward movement as the derailleur moves inward. Thus, the distance between upper pulley and freewheel cog (chain gap) remains constant throughout the gear range. I found that the Huret Allvit shifts very well. It was used on such diverse bikes as the most expensive René Herse randonneurs and relatively inexpensive Schwinn Varsity ten-speeds.

Suntour: The first slant-parallelogram derailleur

For over a decade, racing derailleurs continued to be copies of the Campagnolo Gran Sport. Since all racing derailleurs had a similar geometry, nobody noticed that they could be improved. When Simplex introduced their first parallelogram derailleur, the Juy Export 61, in 1961,²⁴ it added a spring-loaded upper pivot to Campagnolo's design. This repositioned the derailleur when shifting between chainrings in the front. Now the derailleur shifted the same on the big and small chainring. But the basic geometry of the parallelogram remained unchanged.

It took a complete outsider, Suntour of Japan, to come up with a major improvement. During the 1950s and 1960s, the Japanese government sent experts all over the world to study industrial products

and apply the results at home. The Japanese “bicycle experts” went to France and studied the bicycles of René Herse and Alex Singer, among others.²⁵ They probably were aware of the Nivex derailleur. In 1964, Suntour invented the slant parallelogram derailleur.²⁶ The parallelogram was mounted horizontally, like on the Nivex, but on the rear dropout, like the Campagnolo. By “twisting” the body, the parallelogram did not swing straight in and out, but downward as it moved toward a bigger cog, thus following the contour of the freewheel and keeping the gap between upper pulley and freewheel cog relatively constant.

This amazingly simple solution was incorporated into most modern derailleurs soon after Suntour's patents expired in the 1980s.²⁷ Today, all mass-marketed quality derailleurs use this principle, including Campagnolo's.

Notes:

- 1 Berto, F., Shepherd, R., Henry, R., 2000. *The Dancing Chain: History and Development of the Derailleur Bicycle*, Van der Plas, San Francisco.
- 2 Henry, R., 2003. *Du vélocipède au derailleur moderne*. Musée de l'Art et Industrie, Saint Etienne, France.
- 3 Berto, F., 1997. *Rear Derailleur Development Since D-Day*. In: Van der Plas, R. (Ed.): *Cycle History 7*, 7th Int. Cycle History Conference, Buffalo, NY, p. 148.
- 4 French Patent No. 522,628, British patent No. 33 469 / 38 (applied Nov. 20, 1937) and No. 33 471 / 38 (applied Aug. 25, 1938).
- 5 Cyclotourisme 7/1938, p. IX (advertisement) and p. 142 (review). Nivex offered racing and cyclotouring models, with 18 tooth and “unlimited” chainwrap, respectively. The only difference is a shorter tension arm on the racing model.
- 6 Cyclotourisme 7/1939, p. 142 (review of Nivex derailleur).
- 7 Berto, F., 1997 (see 1), p. 148.
- 8 *Vintage Bicycle Quarterly*, Vol. 1, No. 1, p. 11.
- 9 Ernest Csuka, 2003, pers. comm.
- 10 No advertisements for the Nivex appeared in the big cycling magazines *Le Cycle* and *Le Cycliste*. By comparison, almost every issue of *Le Cycliste* included a full-page ad for the popular Cyclo derailleurs. Ernest Csuka (pers. comm. 2003) reports that it was only thanks to a customer that Alex Singer found out about the Nivex.
- 11 Ernest Csuka, 2003, pers. comm.
- 12 While the Campagnolo Cambio Corsa and Paris-Roubaix were not as difficult to use as many think, they still required opening the rear quick release and backpedaling to execute a shift, which meant pulling out of the peloton. For a description, see Heine, J., 1999, *The Learco Guerra with Campagnolo Cambio Corsa Gear Mechanism from the mid-1940s*. *On the Wheel* 11, p. 26-27.
- 13 Berto et al., 2000. (see 1), p. 155. See also *Le Cycle* July 9, 1949, p. 3 and 10.
- 14 E. Csuka, 2002 personal communication. See also Henry, Raymond, 1999: *Alex Singer - An Artisan-Builder of French Quality Bicycles*. In: *Cycle History 9*, 9th International Cycling History Conference, Ottawa, Canada, August 1998, p. 111.
- 15 *Le Cycle*, December 17, 1949, p. 8. See also p. 1 of this issue.
- 16 See Koblet's Tour de France bike, p. 11 of this issue.
- 17 This effect is either reinforced or counteracted slightly by the shortening of the chain and thus repositioning of the pulley cage.
- 18 Carnovalini, R., 1990. *La preistoria del cambio*. *Bicisport*, March 1990, p. 120. Translation by Ron Shepherd. In the 1930s, tens of thousands of Cyclo derailleurs were sold every year in France. R. Henry reports that by 1941, Cyclo made 2000 derailleurs a day (1994. Albert Raimond and the Cyclo Company. In: *Proceedings, 4th International Cycling History Conference*, Boston, USA, October 1993, p. 74).
- 19 18 Camovalli (see 16), p. 124-125.
- 20 pers. comm., 2003.
- 21 The Nivex had a stop and a limit screw on the shift lever. See 6.
- 22 Berto, F., 1997 (see 1), p. 148-149, and Chuck Schmidt, 2003, pers. comm.
- 23 For example, all winning bikes in Paris-Brest-Paris 1956 were equipped with Cyclo, see VBQ, Vol. 1, No. 2, p. 11-13.
- 24 *Le Cycliste* 11/1958, p. 288-289.
- 25 Berto et al., 2000 (see 1).
- 26 G. S. Handley, pers. comm., 2001. See also: Yagami, Shiro, 2001, *Japanese Bicycle Imports and Exports*. In: Ritchie, A., and Van der Plas, R., *Cycle History 11*, *Proceedings, 11th Int. Cycling History Conference*, Osaka, Japan, 8/2000, p. 115.
- 27 See 1, p. 215.
- 28 For example, 1985 Shimano Dura Ace (see 1, p. 258), 1987 Sachs New Success (see 1, p. 268), 1988 Campagnolo Chorus (see 1, p. 272), 1993 Mavic 840.

This article was reviewed by Frank Berto. Ernest Csuka and Raymond Henry also contributed information.