

Disassembly of SRAM i-Motion 9 Internal-gear hub, disc-brake version (hub kindly supplied by David Chase).

Document prepared by John S. Allen, version of March 2, 2014. Most photos are mine; some are by Aaron Goss, <http://rideyourbike.com>. Please read <http://sheldonbrown.com/i-motion-9.html> in connection with this document.

David is strong and weighs 220 pounds (100 kg). He had used the hub for about a year when it locked up so he could not pedal, though he could coast. He gave me the hub already removed from the shell. The SRAM 2010 technical manual, <http://tinyurl.com/o7yxlt>, covers removal from and replacement in the shell for all versions of the hub. Disassembly as shown in this document begins with the right side upwards and the left end of the axle chucked in a vise.

The plastic bearing retainers were broken. It is possible that the hub failed due to a bearing retainer, though another problem revealed itself during disassembly. Keep track of small parts (especially pawls) when disassembling!

SRAM has never sold (or named) individual most internal parts for this hub, or to my knowledge, provided information about rebuilding, so I am going to have to invent names for parts.

1 - Remove right-side locknut



2 - Remove washer. This will come off along with the pulley/ bearing cone assembly if not removed separately.



3 - Remove pulley/ bearing cone assembly



4 - View of right side of hub after pulley/bearing cone assembly has been removed. The driver is now exposed. The right-side smaller bearing cup is visible, just inside the 3-lug fitting for the sprocket. David had already disassembled the hub this far, and the bearing retainer which belongs here is absent.



5 - Remove driver. The cone race of the larger right bearing is on the underside of the driver, not visible in this photo. The cup for that bearing is press-fit into the hub shell.



6 - Remove dog ring. The teeth on its inner face are a ratchet for pawls, not a ring gear. The lugs engage the planet cage (see step 24).



7 - Remove right-side pawl ring. The four cylindrical protrusions mate with the driver, and the pawls engage the dog ring.



8 - Remove shifter cam. The right side of the cam engages the pulley of the pulley/bearing cone assembly. One of the four lugs is cut away to make room for a small spring on the back of the pulley where lugs engage the cam. The left side of the cam pushes parts inside the hub leftward to shift gears. Orientation of the cam matters. Make a note of it.



9 - Now I have turned the hub over and we are looking at the left side. A pawl and a pawl spring are missing, but one pawl remains, oriented to drive the wheel by engaging the ratchet inside the left end of the hub shell. The two narrower recesses at 90 degrees to the pawls probably engage the coaster brake mechanism in the coaster-brake version.



10 - Remove crush nut. This nut is deformed during assembly to prevent it from unscrewing. Replacements are available from Aaron's Bicycle Repair, <http://rideyourbike.com>. Or send your hub to Aaron, as he has a stock of hubs to cannibalize and can do an expert repair.



11 - Remove two washers. There is a washer with internal tabs on top of the larger one (The washers are stuck together with grease in this photo). I disassembled the hub dirty because grease kept some parts, like the one pawl here, from falling out, and so I could still determine where they belonged! Method to my madness...



12 - Remove spring. Notice that it is conical, with the larger end toward the middle of the hub.



13- Make a note of orientation, then remove clutch and clutch ring. The clutch ring slides along the axle to retract pawls of the left-side pawl ring.



14 - Make a note of orientation, then remove clutch actuator.



15 - Remove left-side pawl ring. As noted earlier, a pawl and the pawl spring are missing. These pawls drive the wheel in all of the hub's ratios. The coaster-brake version of the hub would probably have parts engaging the two unused, narrower recesses at 90 degrees from the pawls.

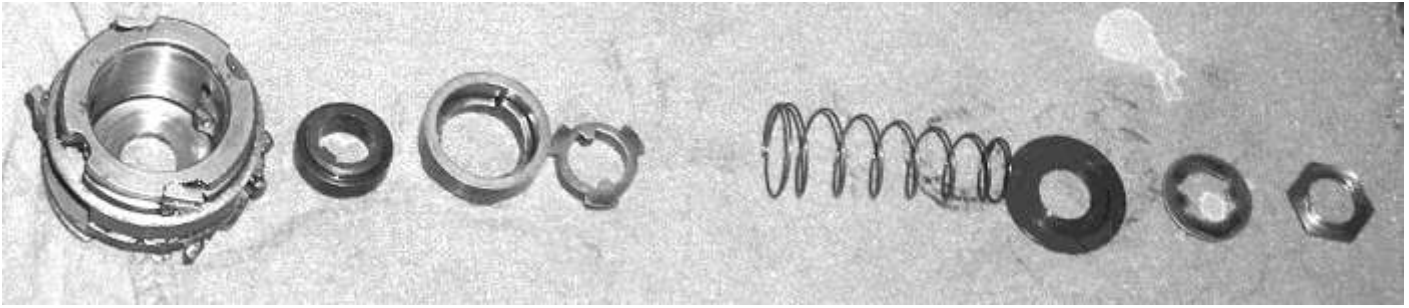


16 – The pawl ring has four sets of pawls. The leftmost set, already described, drives forward and the other three sets are driven forward.





17 - These are the parts which have been removed from the left end of the axle, in order right to left, and left side up (photo credit, Aaron Goss). The left-side shifter parts engage and disengage sun gears to provide wider and narrower ratios – both increase and decrease ratios, which are the inverse of each other.



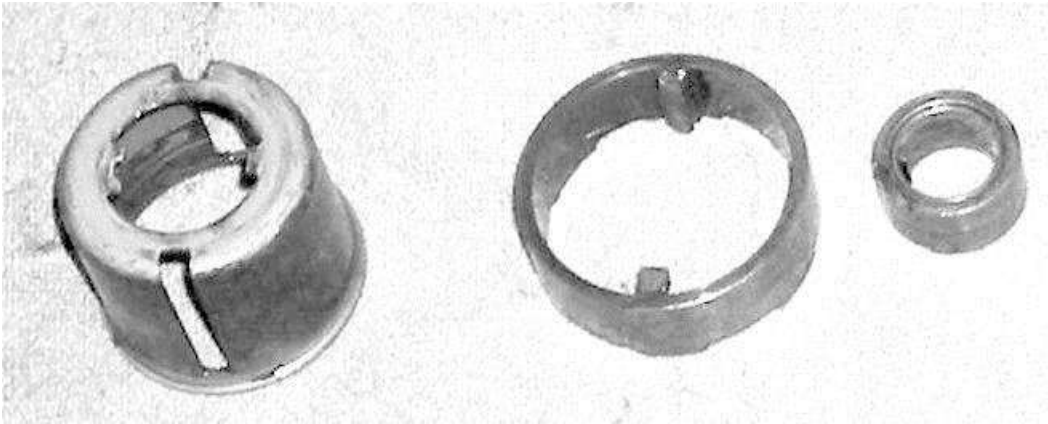
18- Now the gear unit also has been lifted off the axle. The spring here has a smaller diameter than the one removed earlier, and is cylindrical, not conical.



19 – Spring and shifter parts are now removed from the axle.



20- These are parts in the previous photos which have been removed – along with the spring (photo credit: Aaron Goss).



21 -These are shifter parts on one face of the axle. The key at the right engages the shifter cam at one end and the cup-shaped part in the image above at the other. Comparison with photo #19 shows how the key has been slipped off the rod which is to its left. These parts may be removed from the axle, but I didn't remove them.



22 – Shifter parts on the opposite face of the axle. Note: the rod had been replaced in position and is upside down. The end which attaches to the key should be farther from the centerline of the axle.



23 - I've lifted up the key and slid the rod to the left to show how they may be removed. Note: the rod had been replaced in position and is upside down. The end which attaches to the key should be farther from the centerline of the axle.



24 – Now we're looking at the right side of the gear unit, which has been removed from the axle. Remove the large spring. It is conical, larger at the inner end. There are three ways that drive may be transmitted into the gear unit – for decrease, direct-drive and increase ratios and from outside to inside: the pawls on the driver (step 5 above) engage the ratchet inside the ring gear; the dog ring (step 6 above) engages the six notches in the planet cage; or the spring presses down the ratchet ring (step 27) to engage the six lugs of the sun-gear assembly.



25- Remove planet cage assembly from inside ring gear.



26 - Pry inner ring gear (at left) from planet-cage assembly with a flat-blade screwdriver, if necessary.



27 - Remove ratchet ring from inside planet cage. The six lugs at the inside of the narrower end of the ratchet ring engage the sun-gear assembly as shown in step 24.



28 - Separate inner ring gear and sun gear assembly from planet cage



29 -Pinion and pinion pin removed from the planet cage (photo credit: Aaron Goss).



27- Separate inner ring gear from planet gears in sun-gear assembly. Now we see what seized this hub. Wider/narrower increase or decrease ratios depend on which of three sun gears is engaged. Two of them, visible in this photo, may be engaged or disengaged; the remaining one, shown in the next photo, is constantly engaged..



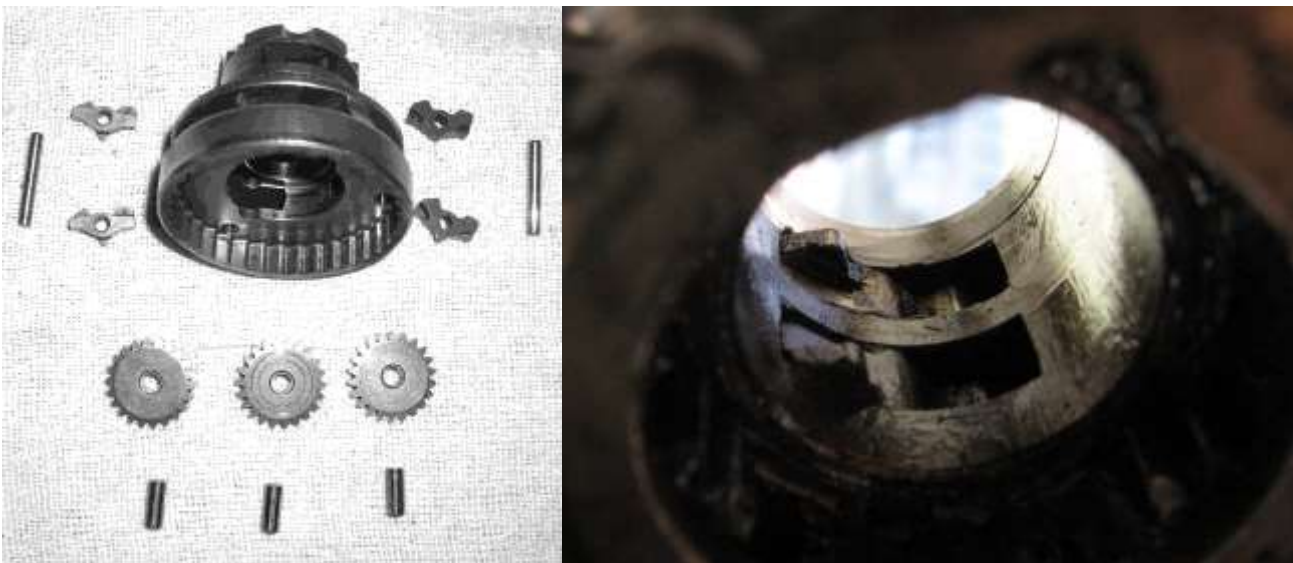
29 –Remove small sun gear from inside planet gears. This frees the pawl pins for the internal pawls – they could fall out.



30 - These are the sun gears and associated parts of the assembly shown in the previous photo, disassembled (photo credit: Aaron Goss). The circlip (left) might be damaged during removal, so you might skip this step.



31- Same assembly, further disassembled. The four small internal pawls are inserted with the peak in the middle facing outwards (engaging the teeth inside the two gears). The larger end of each pawl is clockwise in the image above and counterclockwise in the images below. The pawls are of two types: relieved sides inside the bore face each other. (left photo credit: Aaron Goss).



Here's what's left. Now, to put the hub back together, just replace the broken gears and work back to the start – like [Ginger Rogers](#) dancing all the steps Fred Astaire did, only backwards and in high heels. ☺

