1.

<https://pdfpiw.uspto.gov/.piw?Docid=07967314&homeurl=http%3A%2F%2Fpatft.uspto.gov%2Fnetacgi%2Fnph-Parser%3FSect1%3DPTO2%2526Sect2%3DHITOFF%2526p%3D1%2526u%3D%25252Fnetahtml%25252FPTO%25252Fsearch-bool.html%2526r%3D22%2526f%3DG%2526l%3D50%2526co1%3DAND%2526d%3DPTXT%2526s1%3DLever.TI.%2526s2%3DDrive.TI.%2526OS%3DTTL%2FLever%252BAND%252BTTL%2FDrive%2526RS%3DTTL%2FLever%252BAND%252BTTL%2FDrive&PageNum=&Rtype=&SectionNum=&idkey=NONE&Input=View%20first%20page&fbclid=IwAR0usPnl2cu_OzY9KYJ556h-ZH-BqLpiMeTIyimXjP3CR7VYEsh4zWwVdT0>

* Date of Patent: Jun 28, 2011
* Jurisdiction: USA, none that I can find in Canada
* Covered mechanisms: “The present invention comprises a drive mechanism for a wheeled vehicle, such as cart, comprising a novel hand lever arm, providing a more efficient way to use the body’s force than has been previously provided by such structures. (col 2, row 65)
  + Seems like covers pretty much exactly what we want to do, but at least the jurisdiction doesn’t extend to Canada.

2.

<http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahtml%2FPTO%2Fsearch-bool.html&r=0&f=S&l=50&TERM1=lever&FIELD1=TI&co1=AND&TERM2=wheelchair&FIELD2=TI&d=PTXT>

* Date of Patent: Nov 23, 2010
* Jurisdiction: USA, none that I can find in Canada
* Covered mechanisms: “a transmission configured to translate motion of a lever to drive a wheelchair includes at least one clutch and gear set contained within a hub housing of the main wheel bring driven” (col 3, row 14)
  + Seems like this one covers more specifically their one-clutch-and-gear-set mechanism in combination with level drive.

3.

<http://www.ic.gc.ca/opic-cipo/cpd/eng/patent/2261850/summary.html?query=lever+propulsion+wheelchair&type=basic_search>

* Date of Patent: Jan 29, 1998
* Jurisdiction: Canada
* Covered mechanisms: “When the occupant of the wheelchair rotates and pushes forward or rearward on the crank handles the friction pads come into contact with the hand rail and allows the wheelchair to be propelled forward or rearward.”
  + Crank arm is connected directly to the wheel shaft, so it doesn’t give much mechanical advantage and it seems like it’ll be distantly relevant at most. Good to be aware of it nonetheless.

4.

<http://www.ic.gc.ca/opic-cipo/cpd/eng/patent/2359487/summary.html?query=lever+propulsion+wheelchair&type=basic_search>

* Date of Patent: July 27, 2000
* Jurisdiction: Canada
* Covered mechanisms: “A manual propulsion kit for a wheelchair when the wheelchair includes a frame with two large wheels on either side of the frame journaled to axles on the frame, each of the large wheels mounting a circular handrail”
  + From the picture, it looks similar to (2), so only distantly related.

5.

<http://www.ic.gc.ca/opic-cipo/cpd/eng/patent/2267274/summary.html?query=lever+propulsion+wheelchair&type=basic_search>

* Date of Patent: Apr 1, 1999
* Jurisdiction: Canada
* Covered mechanisms: “The wheelchair employs the use of two push levers (20) attached to two front drive sprockets (13), which propel the two main rear wheels (2) of the wheelchair through chains (11) connecting the front sprockets to gear clusters (9) mounted on the rear wheel axles. Ratchet mechanisms (l8) allow each push lever to transmit power to the drive sprockets in either a forward or reverse direction. Derailers (10) are mounted at each rear axle and are activated by shifter mechanisms mounted on the push levers. Caliper wheel brakes (23) are mounted on the frame beside each rear wheel and activated by hand brake levers (25) mounted on the push levers.”
  + Very, very similar to our push lever design. I imagine these guys will be who we will be contesting mainly.

6.

<http://www.ic.gc.ca/opic-cipo/cpd/eng/patent/2971710/summary.html?query=lever+propulsion+wheelchair&type=basic_search>

* Date of Patent: Dec 23, 2017
* Jurisdiction: Canada
* Covered mechanisms: “A hand propelled wheeled vehicle, specifically a wheelchair, containing a pair of hand actuated, lever driven mechanisms to rotate the main wheels … The arrangements of the clutches utilize both the forward (pushing) and backward (pulling) stroke of the lever to rotate the main wheels forward. Steering and braking control is afforded through attachments integral to the hand grips of the right and left hand levers, respectively.”
  + Seems like these guys used a similar lever arm design to (5), but circumvented them by coming up with a more convoluted way to transfer power from lever arm to wheel.

7.

<http://www.ic.gc.ca/opic-cipo/cpd/eng/patent/2650629/summary.html?query=lever+propulsion+wheelchair&type=basic_search>

* Date of Patent: Nov 8, 2007
* Jurisdiction: Canada
* Covered mechanisms: “The levers have curved drive ends, the faces of which include a length of roller chain to mesh with freewheels on the hubs of the wheel axles and are held in sufficient co-operation against the freewheels due to tensioning.”
  + Looks like a rack and pinion, but the rack is round and attached to lever arm.

8.

<http://www.ic.gc.ca/opic-cipo/cpd/eng/patent/2472716/summary.html?query=lever+propulsion+wheelchair&type=basic_search>

* Date of Patent: Aug 21, 2003
* Jurisdiction: Canada
* Covered mechanisms: “Rotatably mounted upon opposite ends of the axle are two lever arm assemblies, each comprised of a discrete lever arm ending in a handle and extending far enough from the axle to allow an occupant of the seat to grip the handle … two guide bars can be fixedly attached to the frame, one upon each side of the frame and extending parallel to the plane of a respective driving wheel, the handle of each lever arm is slidingly coupled to a discrete one of the guiding bars and the handle and the lever arm are linked by a linkage configured to allow the handle to follow the guide bar while the lever arm move about an axis of the axle.”
  + Similar to other rail-and-gears-and-lever-arm designs, but lever arm moves linearly rather than in rotation.

9.

<http://www.ic.gc.ca/opic-cipo/cpd/eng/patent/2615371/summary.html?query=lever+propulsion+wheelchair&type=basic_search>

* Date of Patent: Jan 25, 2006
* Jurisdiction: Canada
* Covered mechanisms: “The drive member is arranged for movement from a first operational position in which the drive wheel is not locked to the output member to a second operational position in which the drive wheel is locked to the output member, and back to the first operational position, under the control of a user of the vehicle. The drive system allows the user to choose between propelling the vehicle using the drive system or disengaging the drive system from the drive wheel and propelling the vehicle by some other means, for example by wheel rims.”
  + This patent is vague on drive mechanism, but focuses more on engagement/disengagement of drive mechanism.

Summary:

* Lever arm power transmission seems like a well discussed problem. There’s tons of patents on it. We’re bound to infringe on some patent, so it’s just picking your poison at this point.
* Better copy from a known patent than trying to come up with your own mechanism and unknowingly infringing.