IDbike Systems

E-drives from the founding fathers of the European EPAC

July 2014

The Roots of the European EPAC

IDbike history & track record

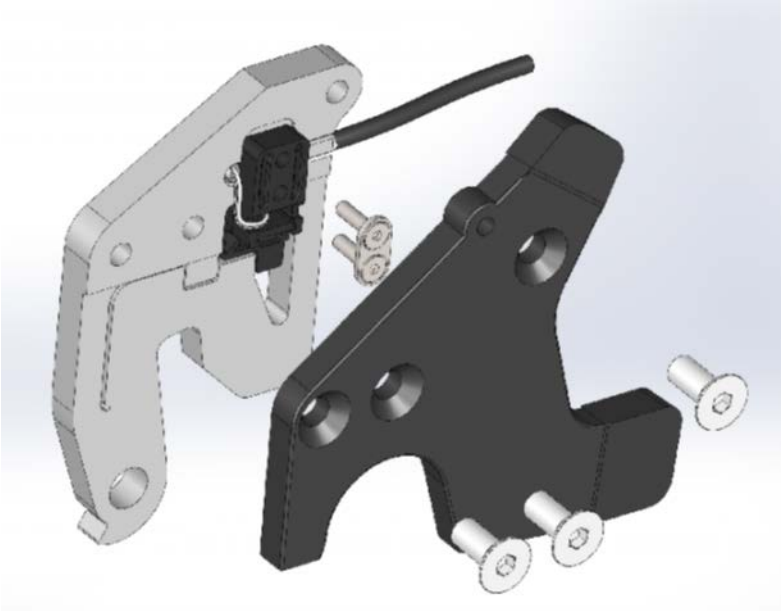
- 1997 Start-up: Coming from automotive industry, Van Doorne Transmissions, drive train experts
- 1999 Concept & design of Sparta ION (still today one of the best sold European E-bikes)

IDbike history & track record

- 1999 ~ 2009: 5 patented Torque Measurement Methods
  - TMM1, rear axle
  - TMM2, speed hub cone
  - TMM3, spinning & fitness equipment
  - TMM4, rear dropout
  - TMM5, chain ring
- 2005 ~ 2007: Design & engineering of JD TranzX E-Drive system
- 2006 ~ 2007: Design & engineering of Gazelle Innergy E-drive system, Dutch Bike of the Year 2009
- 2008: Design & engineering of LBH / Topone folding E-bike for Japanese hybrid market
- 2008 ~ 2010: Design & engineering of SR Suntour E-drive system
- 2009: Design & engineering of Ultra Motor A2B Hybrid E-bike
- 2010: Design & engineering of Raleigh UK Velo Cité E-bike

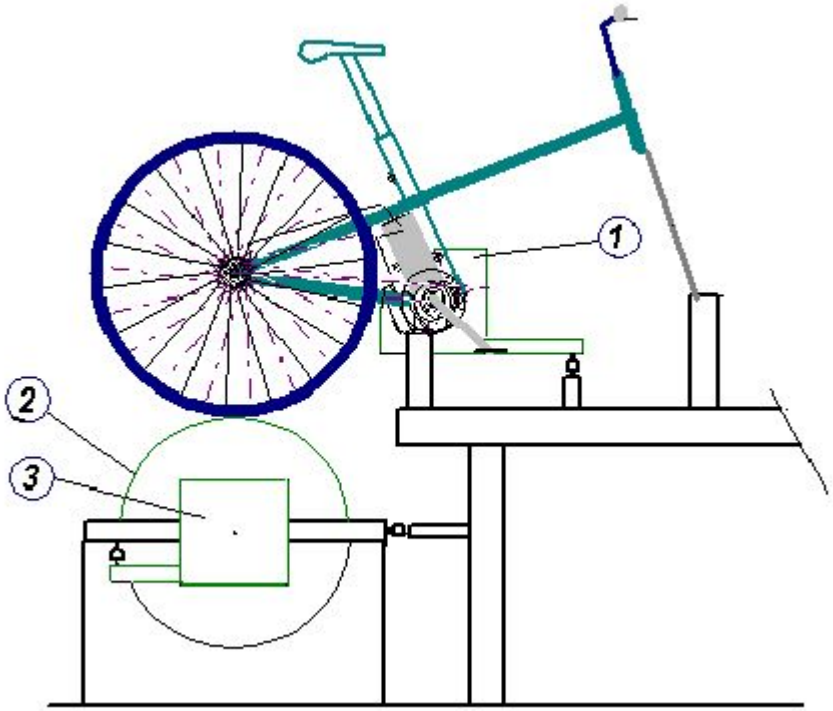
IDbike history & track record

- 2009: Start of TMM4 manufacturing (made in Holland)
- 2010: IDbike Systems (drive train systems for EPAC's)
- 2012: Start of mass production of TMM4 V2, 2nd generation
- 2013: Start of mass production of TMM4 full assemblies



IDbike test lab

- Uniqueness and function of IDbike test rig, the heart of all our developments



IDbike LEVA test lab

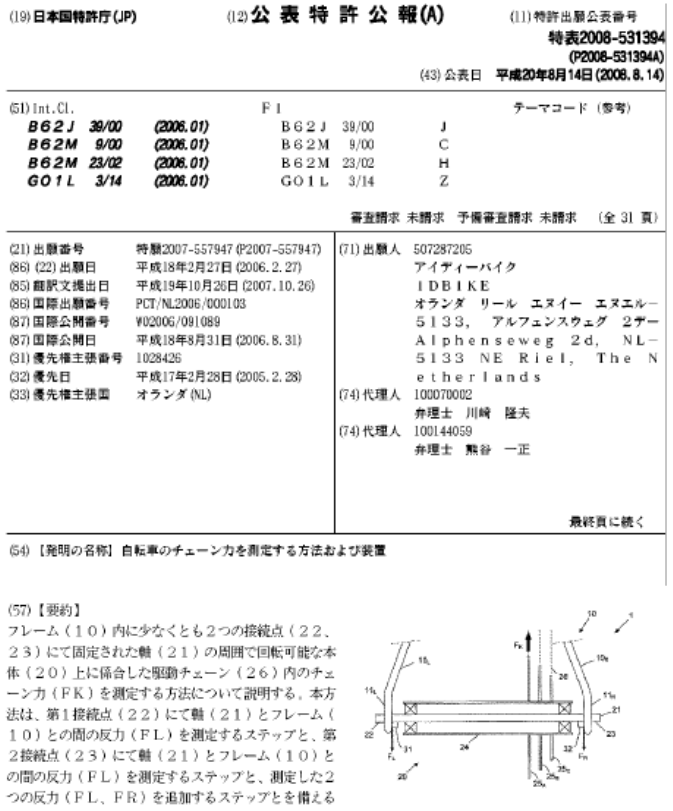
- Testing of drive train efficiency
- Mapping electromotor characteristics
- Testing efficiency, torque, power
- Testing durability
- Developed the LEVA E-bike test protocol
- Official LEVA notified body for conducting LEVA-test

TMM manufacturing in Holland

- TMM4 Gen. 1 → TMM4 Gen. 2
  - Tighter tolerances on sensitivity (+/- 3%)
  - No hysteresis
  - No temperature sensitivity
  - Ease of assembly line procedures
- ISO 9001
- TMM Assemblies

IDbike Systems, E-drive supplier

- TMM Sensor & Assemblies
- Motor Controller / Driver
- Display, user interface
- Software with parametric riding programs
- IP protected by world wide patents:
  - WO, EU, US, CN, JP and Taiwan



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(54)【発明の名称】自転車のチェーン力を測定する方法および装置

(57)【要約】
フレーム（１０）内に少なくとも２つの接続点（２２、２３）にて固定された軸（２１）の周囲で回転可能な本体（２０）上に係合した駆動チェーン（２６）内のチェーン力（ＦＫ）を測定する方法について説明する。本方法は、第１接続点（２２）にて軸（２１）とフレーム（１０）との間の反力（ＦＬ）を測定するステップと、第２接続点（２３）にて軸（２１）とフレーム（１０）との間の反力（ＦＬ）を測定するステップと、測定した２つの反力（ＦＬ、ＦＲ）を追加するステップとを備える

IDbike Systems, E-drive supplier

- **TMM Sensor & TMM Assemblies**
  - Perfect linearity (pedal torque versus output signal)
  - Reactivity, responsiveness
  - Precision & accuracy
  - Synergetic, harmonious and intuitive riding feeling
  - No need for a brake switch
  - Robustness, stationary part
  - Unlike most competitors, TMM measuring both legs
  - Left leg, right leg, RPM, power measurement
  - 'Best in Class' performance/cost ratio
- Motor Controller / Driver
- Display, user interface
- Software with parametric riding programs

IDbike Systems, E-drive supplier

- **TMM Sensor & TMM Assemblies**, field of applications:
  - 1. Torque measurement for Pedelecs / EPACS, Electric bicycles
  - 2. Power measurement:
    - Fitness Club equipment, indoor bikes, fitness bikes
    - Hospital & Revalidation equipment
    - Power measurement computers for racing bikes
  - 3. Automatic gear shifting
- Motor Controller / Driver
- Display, user interface
- Software with parametric riding programs

IDbike Systems, E-drive supplier

- TMM Sensor & TMM Assemblies
- **Motor Controller / Driver**
  - For 24V ~ 48V systems and 180W ~ 500W systems
  - BLDC & PMSM driving controls
  - Max continuous current: 17 A
  - Max peak current: 25 A (60 sec.)
  - Quiescent current: < 50µA (in standby)
  - No on/off switch needed
  - Linbus interface
  - SOC: 4 types communication protocols
  - EN 15194 conformity
  - Programmable through LCD-display
  - 87 x 55 x 31 mm.
- Display, user interface
- Software with parametric riding programs

IDbike Systems, E-drive supplier

- TMM Sensor & Assemblies
- Motor Controller / Driver
- **Display, user interface and OEM-interface**
  - LCD, graphical-type (programmable) with remote control
  - Back light (3 options: white, blue and white/blue mixed)
  - Parameterised interfacing with motor controller
- Software with parametric riding programs

IDbike Systems, E-drive supplier

- TMM Sensor & Assemblies
- Motor Controller / Driver
- Display, user interface
- **Software with parametric riding programs**
  - For European EPAC, complying with European legislation
  - For Japanese EPAC, complying with Japanese legislation
  - For other type of EPAC's, Speed Pedelecs and E-bikes

IDbike Systems, strategic partners

- System integration remains terrible headache for OEM-bicycle manufacturers and system suppliers.
- Full system suppliers offer little flexibility and little customer orientation.
- With more than 15 years of engineering and development experience for electric two-wheelers and with IDbike's test rig, we are capable of designing well balanced E-drive systems and taking care of your system integration.

IDbike Systems, riding feeling

There is no accounting for taste, however **an electric bike must**:

1. Start in a safe and controlled way, in all riding modes (eco to boost).
2. Be intuitive, through a swift and reactive response on the cyclist's pedal torque input.
3. Be repeatable and reproducible under all circumstances, must ride predictably and stable. Perfect and harmonious synergy between man and machine, riding your bike without worries and without thinking. The pedal support must be obvious and natural, like state-of-the-art power steering in cars. It's there, you just don't notice it, until it's not there anymore.
4. Nevertheless the character of your electric bike can be adjusted and selected by tuning the parameters, according to your own personal choice and taste.
5. IDbike will support their OEM-customers in tuning these parameters.
6. Our graphical LCD display can be used as the interface for tuning the riding parameters.