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EUROPEAN PATENT OFFICE
Erhardtstrasse 27
D-80298 München
GERMANIA /GERMANY

Pisa, 12 July 2019

Re: PCT – Direct / Informal comments

Accompanying letter for replying to the objections raised by the EPO in connection with the Italian application No. **102018000007150** dated 12/07/2018 claimed as priority of the present PCT application.

Applicant: *Scuola Superiore di Studi Universitari e di Perfezionamento Sant'Anna*
Our reference: B30/0544

Dear Sirs,

This is a reply to the objections raised by the EPO against the above-indicated Italian patent application claimed as priority of the present PCT application.

1. Amendments

D1 has been cited in the prior art section.

A new figure 5 has been added and described in the description section.

No amendments have been made on claims 1-15.

Claims 16 and 17 have been added. Description has been amended accordingly.

2. Arguments

2.1 Novelty

Present claim 1 is new over the prior art, since no one of cited documents D1-D5 discloses the following feature:

[a] "said system (100) being configured in such a way that when said second electric field E_2 interacts with said first electric field E_1, said control unit measures a variation of said density of charge q_1 proportional to a distance d between said sensitive element (110) and said responding element (120)"

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2.2 Inventive step

The Applicant agrees with the Examiner considering D1 (US2017031050) as closest prior art.

D1 discloses a distance measurement system including a tank circuit including a transmit coil coupled to a transmit capacitor, a distance calculation circuit coupled to the transmit coil, and a target resonant circuit including a receive coil coupled to a receive capacitor. The receive coil is arranged to receive a magnetic field generated by the tank circuit. The distance calculation circuit is arranged to determine a reflected admittance. The reflected admittance includes a real component and an imaginary component. The distance calculation circuit is arranged to determine a distance between the transmit and receive coils based on the imaginary component of the reflected admittance.

Present claim 1 differs from D1 for the **distinguishing feature** *[a]*, since in D1 there is not a measurement of the variation of density of charge.

In fact, Applicant respectfully disagrees with the Examiner in comparing the *coefficient of coupling (parameter k)* described in D1 with the *variation of density of charge* present in claim 1, since the coefficient of coupling is defined as a number between 0 and 1 *"dependent on the portion of the total magnetic flux lines that cuts both coils L1 and L2"*.

This means that the value assumed by the coefficient of coupling depends on the interaction between the magnetic fields generated by the coils L1 and L2. Instead, the variation of density of charge is a completely different parameter, since it doesn't need of a magnetic field to be measured, but only of an electric field.

As confirmation of this, please consider that a variation of density of charge could be measured by the control unit even in case that the responding element was a passive element, not electrically powered and not able to generate an electrical field. The responding element could be even a not metal element, but a piece of plastic, although obviously there would be a much lower variation of density of charge, and therefore a reduction of the detectable distance.

The **technical effect** of distinguishing feature *[a]* is to allow to detect a much greater distance, between the sensitive element and the responding element, with respect to D1.

This is confirmed by the following graph, in which for different distances the tension ΔV is measured, due to a variation of variation of density of charge q_1. The graph is logarithmic. It is possible to see that, using an active responding element,

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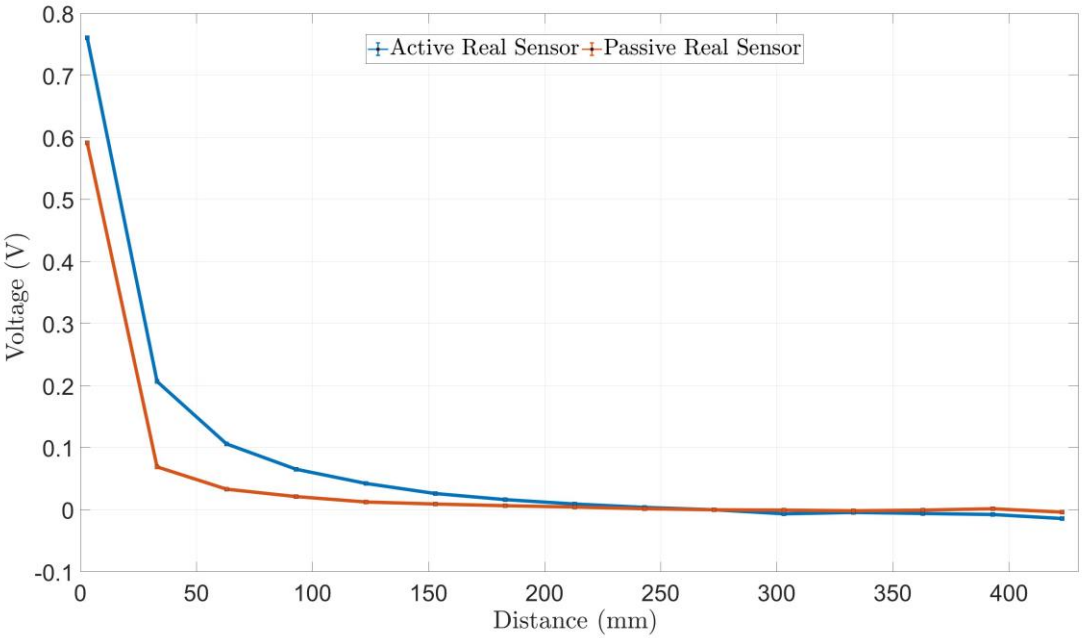
a tension is measured for distances bigger than 200 mm. On the other hand, in figure 3 of D1, the maximum distance detectable is 30 mm.



Increasing the detectable distance is very useful in every field of application, and in particular in robotics, for preventing a collision between a robot and a human being or an object. In fact, 30 mm are often a distance too short to have the time to change the direction of the robot and prevent such collision.

Therefore, the **technical problem** solved by the present invention can be defined as how to improve the device of D1 in order to allow the detection of a much greater distance between the sensitive element and the responding element.

Such problem is never faced in D1, and it never mentioned or suggested to measure the density of charge instead of the admittance or the coefficient of coupling based on the interaction between the magnetic fields generated between coils L1 and L2.

Therefore a skilled person, starting from D1, could not feel the necessity to solve the above mentioned technical problem, and would not have any suggestion to arrive to the solution of claim 1.

Furthermore, not even documents D2-D5 faces such problem.

Therefore present claim 1 involves an inventive step with respect to D1 both alone and in combination with any document D2-D5.

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3. Conclusion

The Applicant respectfully believes that present claim 1 of the PCT application meets the requirements of the PCT with respect to novelty and inventive step (Art. 33(3)).

Yours faithfully

AGENZIA BREVETTI & MARCHI

Marco Celestino