How to make the handle hover

Without special ideas the DSC input device would suffer from a serious lack: The handle, the grasp will not hover, but rush down due to gravity.
A simple way helps for cheap constructions: the use of constant force springs:

a constant force spring is a rolled ribbon of spring steel, where the spring is relaxed, when it is completely rolled up.
If you tear the end, while the axis of the spring is kept at the place, and a spool on a ball bearing carries the spring, then your hand feels a constant force nearly independent of the elongation. (see picture 1)

Now our DSC: look only on that part of the construction, that is only the vertical rail , where the handle and its carriage run up and down. (see picture 2)
Then it is the easy idea, to position the constant force spring on top of the rail, and fix the end somehow at the handle. Of course, the handle weight is the force, which has to be compensated by the force of the spring. If the spool is constructed as a cartouche, which is exchangeable like an printer ink cartouche, then the whole cartouche is easy to remove as a spare part, which is easy to service. This kind of spring tires after 4000 up to 100 000 cycles, and sometimes should be changed. The springs are cheap (fraction of 1 Euro) after being developed, and are usually developed for a given force.

The remaining zero force deviations can be covered by a small friction, which is chosen properly. (remind: my old prototype had only friction brakes to hold the full weight, the handle was far too heavy, and still the performance wasn´t too bad.) Light handle, few tens of grams, and compensation, this will easily give an extremely good performance!

A second order matching could be, if necessary at all: the weight of

handle + elongated spring part is slightly a linear slope(diagram: weight force versus elongation), while, correspondingly, the radius of the rest spool is decreasing, therefore the curvature bend per length unit increases, and so the retracting force. Free development parameter of the spring is width, because to obtain a given force, you calculate width times thickness, only the thickness influences the matching force slope. This contributes to more precise zero force matching.

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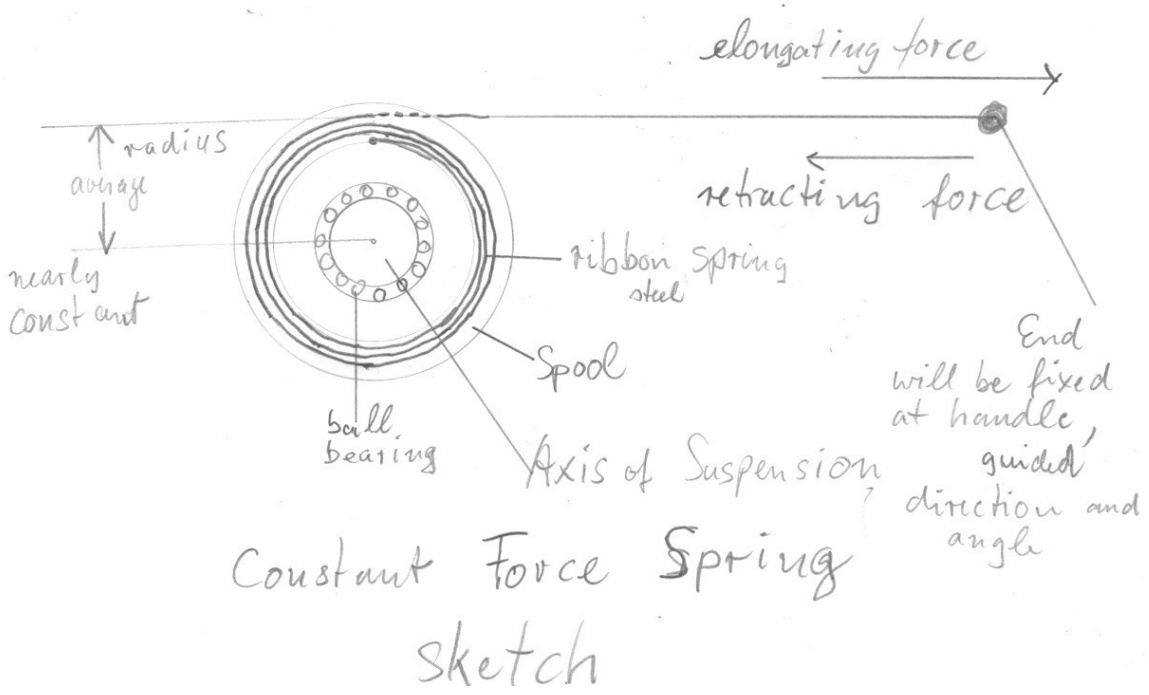
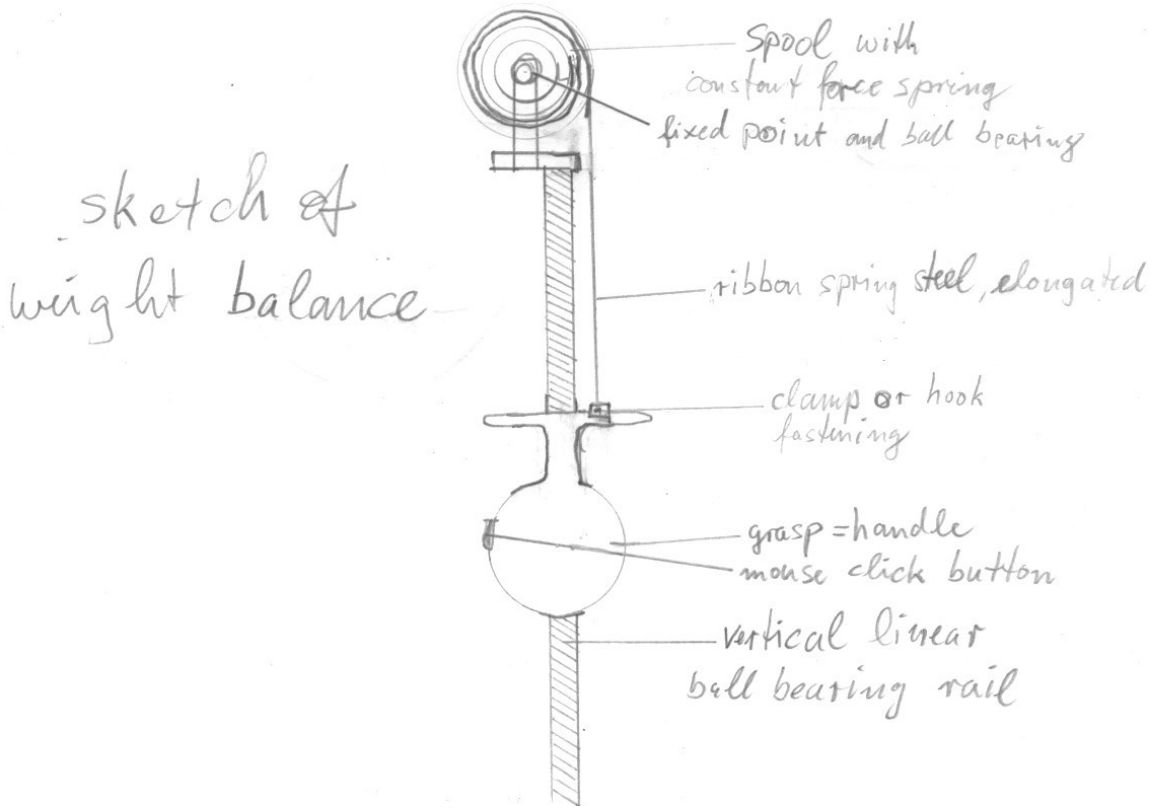
The retraction force function is only rough, since the real trajectory of the spring will differ slightly from circle + straight line shown in picture 1. There is no size limit for those springs, the wrist watch industry uses even very small ones.
These thoughts were done asking several experts in the beginnig of 2007. At that time I tried to win a team for startup development. It showed up, that companies prefer to work secretly.

<u>Picture 1:</u>



Picture 2:


sketch of
weight balance
Spool with
constant force spring
fixed point and ball bearing
ribbon spring steel, elongated
clamp or hook
fastening
grasp = handle
mouse click button
vertical linear
ball bearing rail