Re: The mechanism behind bouncing...

Source: http://sci.tech−archive.net/Archive/sci.electronics.basics/2007−02/msg00138.html

- *From*: "Jon Slaughter" <Jon_Slaughter@xxxxxxxxxxx>
- *Date*: Sat, 03 Feb 2007 21:58:27 GMT

"John Larkin" <jjlarkin@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx> wrote in message news:kcl9s21bv0ulr6m2sdjlnkffdftp8mh68c@xxxxxxxxxx

> On Sat, 03 Feb 2007 08:13:46 GMT, "Jon Slaughter"
> <Jon_Slaughter@xxxxxxxxxxx> wrote:
>
>> "KILOWATT" <kilowatt"nospam"@softhome.net> wrote in message
>> news:45c3aa6d$0$31564$c3e8da3@xxxxxxxxxxxxxxxxxxx
>>
>>> Hi... thanks for your attention.
>>>
>>> I just wish to know the precise reason why for example, a
>>> digital
>>> counter
>>> may count many pulses on it's clock input when the clock is
>>> feed via a
>>> non
>>> noise−free source like a mechanical switch. It is because
>>> when the
>>> contacts
>>> makes/breaks, arcing (i've read somewhere that there can be
>>> a
>>> possibility
>>> of
>>> arcing even at low voltage) occurs, or if it's because of the
>>> very rough
>>> surface (microscopically−speaking) of the switch contacts,
>>> were the
>>> metal
>>> molecules grinds (and possibly flexes) together, during
>>> switch
>>> activation?
>>> TIA for your reply.

> The atoms of the two materials are not configured in such a way that there is complete contact. If they were then the materials would be fused. Since there are not fused and they slide there is friction involved and this friction causes the contacts to move farther a part and then closer together. So the average distance between the constants is changing significantly campared to when is not moving and they are making good contact. So now the electric field is changing because of the distances changing between the contacts. As the contacts move farther away the field becomes weaker but now we have a capacitive effect. This effect creates a force between the contacts that attract them. One now has a kinematic force
> pulling the contacts away(so it can slide), one of friction that wants to stop the slide, and one of capacitance that is attractive(I'm sure there are
> more too).
>
> > Sorry, but that's all nonsense. At low voltages and currents, switch contacts bounce for purely mechanical reasons.

Um, and you seem to think that mechanical bouncing is some real thing. Its an abstract concept. There is no real think as bouncing. When a ball bounces you think that the surfaces are idealized. No, they are governed by quantum mechanics. Believe it or not, doesn't matter ot me.

> > If your field theories were true, the applied voltage would radically change the bounce waveform. It doesn't. Try it.

hmm. so the waveforms are exactly the same? They do not scale with voltage? You seem to think that ohms law doesn't apply here? V = IR or did you not learn that? What do you really think these waveforms will look like? Do you think they will be perfect unit step functions? Get into the real physics of it and stop trying using idealized descriptions of the behavor.

http://www.ece.uci.edu/rfmems/publications/papers/mems/C021−EUMTT99.pdf

http://www.scienceprog.com/dealing−with−switch−bounce−problem/

Do you really think that the effects I'm talking about are going to radically change the macroscopic scale? The time scale is femto or less and the forces are fN or less. (although the above analysis are still idealized)

Your logic is like saying a resistor behaves exactly the same no matter what conditions. Your a bafoon in thinking that everything is some simple

mathematical equation that you learned in cal 101.

You think that a resistor doesn't change its "waveform" with voltage? R = V/I. What happen when V is very low? what about when V is very high? What about most of the time? Most of hte time R is the APPOXIMATELY constant. THATS RIGHT!!! A resistor doesn't change its "waveform"(which is wrong way to put it as switches and resistors are not waveforms) for a wide range of voltages. If this what the case then they would be practically useless.

Did you ever take quantum mechanics 101? Hell, even basic physics supplies an approximately correct answer. Coulomb's law for the contacts state something like

Sum(k*Qi*Qj/r_ij^2,i=1..N)

(this is better described in a statistical quantum fashion but I don't want to confuse your little brain)

Do you think that distances in this equation have some special meaning between when a switch is open and not? Sure there is a point where the strenght of the field drops off almost to 0 but it is not instantaneous.

The OP asked for the microscopic answer and not something you read out of an electricians manual.

(BTW, show me some waveforms's from two different switches using the same voltage and lets see if they are even close. Hell, show me two waveforms from the same switch using the same voltage and lets see if they are even close.)

> Anyways, So there are all these forces that are interacting and the end result is this oscillation of the contacts moving toward and away from each
> other. One always gets "arcing" but thats kinda relative turn. (In some sense all electronic flow is "arcing".)

> Metallic conduction is not "arcing." Arcing is gaseous conduction. Vacuum tunneling happens too, but the range is just on the order of an atomic diameter, not important for things like switch contacts.

So we cannot have an arc in a vacuum without any gas? Hmm, can you prove this? I think this would go to explaining a lot about vacuum tubes(I guess they don't "arc" or must contain a gas(a significan't amount to explain the arcing)).

It may not be significant to you but you are not the genius you think you are. People like you are satisfied with any explaination that doesn't confused them people like the KILOWATT want to know the real reason why things work. You take it on faith(sure, you might look at a few switch characteristics using an oscilliscope but then you do not care to go farther) while he wants to know the real reasons. The difference is one of religon and one of science.

The same factors that cause friction are at work with a mechanical switch. You can ignore this all you want and thats fine. But don't try to act like the world is some idealized place that is perfectly described by few simple mathematical equations. (all equations are wrong to some extent and some are better than others. Usually the better equations are more complicated).

Your logic is like "A diode is a switch" while mine is "A diode is a device that can behave like a switch but this is because of the properties of the material. (then I'd have to talk about doping, holes, drift, junctions, valence electrons, pauli exclusion principle, etc...). Rarely is any simple explination the full explination.

If he asked what was switch bounce then your answer is good enough. What he asked was what was the microscopic reason for switch bounce. Now I didn't talk about quarks because obviously that level is to low and there is no need(as far as we know). Even the theory of friction at the atomic level is not know that well. But this is the best level to explain it because you get at the heart of the reason. Now my explinations might not be perfect but just because you think they are wrong doesn't mean they are. I also never said the effects were significant, but there is a macroscopic effect.

Its fine if you want to act like the world is not made up of atoms and idealize everything. I have no problem with that. But when someone else wants to know more then don't try to make them believe what you believe. Only thing I can think of is that your afraid that if they go and explore that they might prove you wrong. So you care more about looking right than being right.

Did you factor in resistance into your switch? Didn't think so. Do you know that resistance depends on voltage? (doesn't matter how, just that there exists two different voltages that produce two different values of resistance). You know that voltage and heat are related? (Even directly. Not that its significant. Even absolutely zero cannot stop an atom from moving.)

Anyways...

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