Re: The mechanism behind bouncing...

Source: http://sci.tech−archive.net/Archive/sci.electronics.basics/2007−02/msg00184.html

- *From*: John Fields <jfields@xxxxxxxxxxxxxxxxxxxx>
- *Date*: Sun, 04 Feb 2007 12:08:53 −0600

On Sun, 04 Feb 2007 14:25:19 GMT, "Jon Slaughter"
<Jon_Slaughter@xxxxxxxxxxx> wrote:

> "John Fields" <jfields@xxxxxxxxxxxxxxxxxxxx> wrote in message
> news:g99as2pkr9ugvcobb2r7upq2ck7f50v71j@xxxxxxxxxx
>
> > On Sat, 03 Feb 2007 08:13:46 GMT, "Jon Slaughter"
> > <Jon_Slaughter@xxxxxxxxxxx> wrote:
> >
> > > The atoms of the two materials are not configured in such a
> > > way that there
> > > is complete contact.
> >
> > −−−
> > That's not true.
> >
> > When the contacts come to rest after the bouncing period is over
> > they will either be in intimate contact or they will be completely
> > separated.
> > −−−
> >
> > If they were then the materials would be fused.
> >
> > −−−
> > Which, indeed, they are until the coil is de−energized and the
> > return spring exerts force on the armature, breaking the microscopic
> > weld(s) and allowing the contacts to open.
> > −−−
>
> So can you shear a part a solid piece of metal with a spring?

−−−
Yes.
−−−

> Its a matter of degree.

−−−
Of course. Have you ever seen how a set of contacts is made?

Usually one contact is flat and the other rounded (or they're both rounded) so that when they're in contact with each other only a very small area of metal is involved in making the contact.

That way, when the contacts bounce and microscopic welds are made between the contacts, the spring will have the strength to break the welds and open the contacts.
−−−

> If the contact interface was completely "fused" then thee would not be any contact interface(assuming the same material is used for both contacts).

−−−
It doesn't make any difference if the metals are dissimilar or not, at the weld there is no "interface".
−−−

> > 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.
>
> −−−
> No. The friction you're talking about is only about the contacts rubbing against each other when they're making or breaking and is a second order phenomenon compared to bounce, which occurs when the contacts alternately make and break when the coil is energized. Bounce also occurs when the armature is de−energized, but to a lesser degree, and is caused by the moving contact skipping across the stationary contact when the coil is de−energized.
> −−−

> The friction is due to electrical forces.

−−−
http://en.wikipedia.org/wiki/Friction
−−−

> > There are only 4 known
> > forces(well, 4 main ones) in the world. Gravitations, Electrical, Strong and
> > weak. Gravitational is like 10^(−40) smaller than electrical. The strong
> > and weak work only as a sub−atomic level.
> >
> > So are you saying there is some other forces involved?
>
> −−−
> Nope, but I'm talking at the macro level where when two materials
> are pressed together more and more tightly it becomes more and more
> difficult to slide them past each other.
> −−−
>
> > 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).
> >
> > −−−
> > No. The high−level bouncing behavior is due only to the gross
> > mechanical characteristics of the contacts and has vanishingly
> > little to do with the microscopic effects, which are at least six
> > orders of magnitude smaller than the mechanical effects, I'd guess.

Sure, but we are not talking about high level.

−−−
I am, because that's all that's needed to describe contact bounce in response to the OP's question.
−−−

The high level is strictly
due to the averging of the microscopic.

−−−
Yes, but so what?

What the OP wanted to know about was what caused the false count and I can assure you that the electrostatic attraction or repulsion of the contacts has nothing to do with it. It's merely the contacts making and breaking repeatedly until they settle down, and that's caused by a movable mass on the end of a spring bouncing against a fixed mass.
−−−

See above about the forces.

−−−
Poppycock.
−−−

Do you have some hard numbers which would prove otherwise?

Yes I do. 4 forces, 1 is too weak to be of any use for this problem, the other 2 are too weak at the distances we are discussing.

Here, I'll even get you a link with some pretty pictures:

http://hyperphysics.phy−astr.gsu.edu/hbase/forces/funfor.html

How do you explain yourself out of this one?

−−−
The electromagnetic forces are also too weak to account for contact bounce, which is purely mechanical.

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JF
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