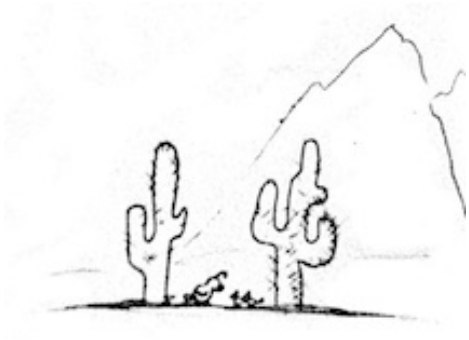


PIANO TECHNICIANS GUILD®
TUCSON CHAPTER

Notes from the last chapter meeting—
May 31, 2017

Meeting Topic: Diagnosing and Treating Friction Problems in Action Centers

Bob Anderson, Presenter

A customer complains about sticky keys. Another customer complains about poor repetition. What is the common problem–friction, too much or too little. Sticky keys in some old Steinway grands can be attributed to too much friction in the action centers (flange bushings) due to verdigris. Poor repetition in some grand actions can be attributed to too little friction in the hammer flanges and the repetition lever flanges. Too little friction in those two action centers means the hammer cannot be supported so that the jack can reset quickly. The principle behind faster repetition in grands is that the repetition lever pushes up on the repetition lever and down on the rest of the whippen which allows the jack to come back under the knuckle after the key is released only part way. Too little friction does not allow the knuckle to be pushed out of the way by the repetition lever and spring so that the top of the jack can slide underneath the knuckle.

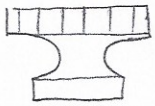
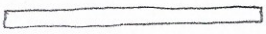
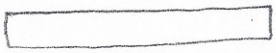
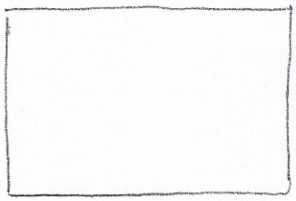
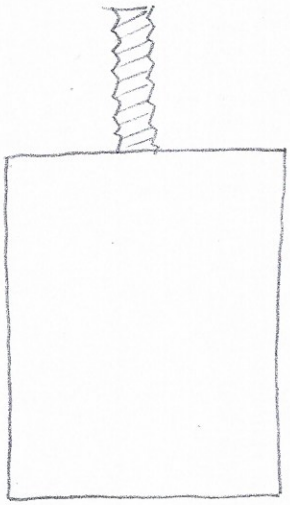
Friction in actions is a primary component in action design. It would seem that to achieve optimal, smooth, and even functioning of the action parts, friction should be eliminated. But this would be wrong. Friction needs to exist, but it needs to be controlled. Parts need to be designed with friction tolerances; manufacturing methods need to be controlled in such a way that parts will meet friction tolerances. For manufacturers, this is a huge problem, because the material that nearly all manufacturers use for action parts is wood. Wood does not lend itself to the minute tolerances that are possible with metal parts. One big drawback is that wood is affected by temperature and humidity. Only careful wood selection and treatment combined with strict temperature and humidity controls can begin to regulate friction problems within the factory. And the same problems apply once the piano leaves the factory. Piano manufacturerers worry about insuring that pianos will work well in the desert and well as the rain forest. As technicians we have to understand friction and learn how to deal with it on the local level.

Bob taught a class on friction several years ago at the annual PTG convention and was eager to give us a reprise along with handouts. In two of the handouts the specs for Steinway and Renner flanges are given. Bob also covered how to calculate friction, so one handout has formulas for that. Measuring downweight and upweight are needed to use the formula, so Bob talked about how to do that. The weights that we buy to measure aren't always accurate. Many technicians are familiar with the stack of weights held together with a bolt/screw. The supply houses sell the basic set, but each disk of the stack is almost always inaccurate. One of Bob's handouts showed the actual weight of each part of the stack. With a good accurate scale, the disks can be modified (filed) so that the actual weight matches what is stamped on the weight. More accurate sets of weights are available but can be pricey.

The outline for the class shows some of the repairs that Bob demonstrated. We tried a number of the things shown to fix tight flanges and loose flanges. One of the significant demonstrations was the change in tone after a tight flange was treated to make it a little less tight. The looser flange had a brighter tone which proved that friction not only affects the feel and touch, but also the tone.

FRICTION IN ACTION CENTERS

I. Measuring friction
    A. Methods
        1. Gram gauges
        2. Friction calculation formula
            a. Accuracy of touch weights
            b. Technique of using touch weights
            c. Friction specifications
II. Treating tight flanges
    A. Lubricants
        1. Protek
        2. Ballistol
        3. LPS
        4 Others?
    B. Heat
    C. Water sizing
    D. Reaming bushings
        1. Reamers
        2. Burnishers
    E. Others?
III. Treating loose flanges
    A. Replacing flanges
    B. Repinning flanges
    1. Condition of bushing cloth
    2. Condition of birdseye
    3. Choice of cloth
        a. Thickness
        b. Preglued
    4. Preparation of cloth
        a. Tearing strips
        b. Sizing strips
    5. Gluing and trimming
    6. Target friction
        a. Clamping time
        b. Friction change over time
    7. Birdseye
        a. Fitting the center pin
        b. Reaming the birdseye
III. Non-traditional action centers
    A. Teflon
    B. WNG
    C. Others?

MARKED ON THE WEIGHT		ACTUAL WEIGHT (GRAMS)
		4.4
1		1.2
2		2.3
4		4.6
8		9.1
16		16.3
32		32.9

TOTAL: 70.8

Steinway Flange Bushing Specifications

Action Part	Resistance	Measuring Point
Grand-Hammer shank flange	3 ±1 grams	23mm from center pin
Grand-Wippen flange	2 ±1 grams	23mm from center pin
Grand-Jack	3^{+1}_{-2} grams	on graphited area of the small arm
Grand-Repetition lever flange	5 ±2 grams	where the drop screw touches
Damper underlever flange	2 ±1 grams	20mm from center pin
Damper body	Should fall from its own weight	

Resistance Of The Jack <u>With Spring</u>
Measured At The Top Of The Jack Where It Meets The Knuckle

Note Number	Spring Diameter in mm	Resistance in grams
1 - 30	1.0	13+2
31 - 50	0.95	11+2
51 - 70	0.90	10+2
71 - 88	0.85	9+2

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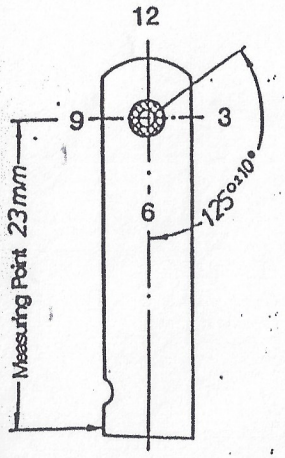
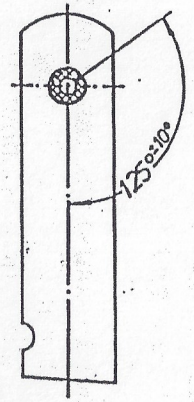
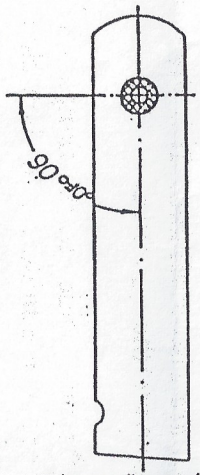


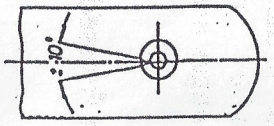
Wippen flange (Upright)
Butt flange
Resistance (R) 2 - 5 gr.



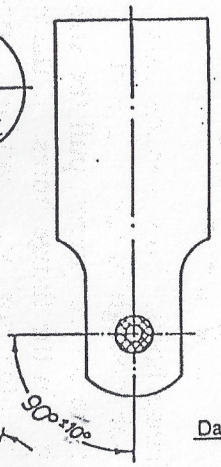
Wippen flange (Grand)
Resistance (R) 2±1 gr ①



Damper flange (Grand)
R 2±1 gr.
①

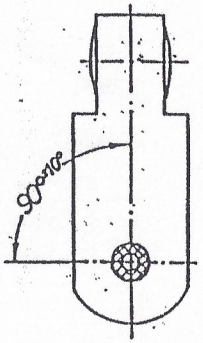


St-Damper flange
R 2±1 gr.
①

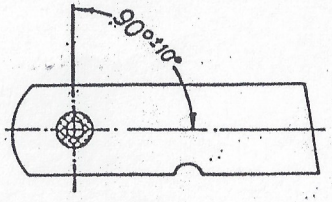


Damper body (Grand)
R 2-4 gr.

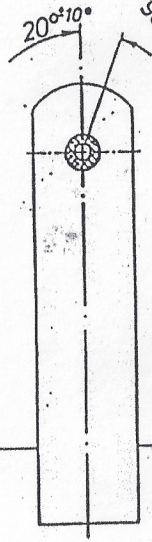
① St-Damper body
falls from own weight



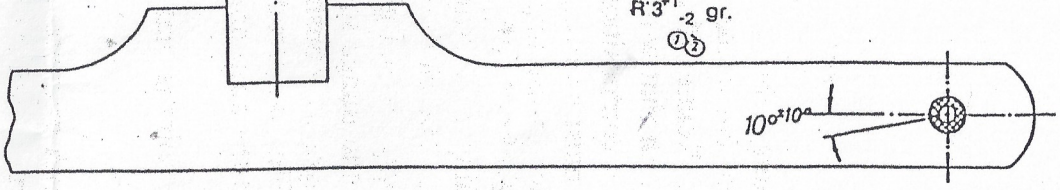
Damper link (Grand)
R 2-4 gr.



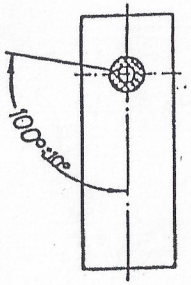
Damper flange (Upright)
R 5-8 gr.



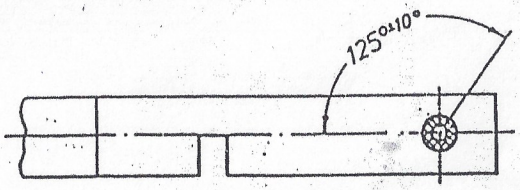
Repetition lever flange
R 5±2 gr.
①



Wippen (Grand)
R 3^{+1}_{-2} gr.
①③



Jack flange (Upright)
R 2±1
②



Hammer shank (Grand)
R 3±1 gr.
①

Unterliegt nicht dem Änderungsdienst

Ausgabe	Änderung	Tag	Name
②	TA He.	9.389	
①	TA-He.	10.188	

	Tag	Name
Bearb.	18581	C. Q.
Gepr.		
Norm.		

LOUIS RENNER · STUTTGART

Tuchschlüsse in Piano- u. Flügel-Mechanikgliedern

Maßstab 25:1

WZ 260

TOUCHWEIGHT TECHNIQUES
FOR THE TROUBLESHOOTING TECHNICIAN

Bob Anderson, RPT
PTG Institute
July 2-6, 2003
Dallas, Texas

TERMINOLOGY:

Balance Weight (BW) - The weight placed on the Measuring Point that causes the key to be balanced.

Down Weight (DW) - The minimum weight placed on the Measuring Point that causes the key to drop with a slow, even motion of the hammer.

Friction Weight (F) - The minimum weight added to the Balance Weight that causes the key to drop with a slow, even motion of the hammer OR The minimum weight subtracted from the Balance Weight that causes the key to rise with a slow, even motion of the hammer.

Up Weight (UW) - The maximum weight placed on the Measuring Point that the key can lift with a slow, even motion of the hammer.

EQUATIONS:

1. **BW = (D+U)/2** 2. **F = (D-U)/2**

ALGEBRAIC DERIVATIONS:

1. **BW = D - F**
2. **BW = U + F**
   add equations 1 and 2
3. **2 BW = D + U**
4. **BW = (D + U)/2**

5. **F = D - BW**
6. **F = BW - U**
   add equations 5 and 6
7. **2F = D - U**
8. **F = (D - U)/2**

A GEOMETRIC INTERPRETATION