Damper Trouble-Shooting
in Vertical and Grand Pianos
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In the 1980's Jurgen was trained in Germany as a piano maker. Trouble-shooting dampers is a huge field that could cover days of training. Because this is only a 90-minute time slot, this class will cover only a few things in detail. Most people work on verticals and in homes. There are ways of improving damper systems, which is worth discussing as well.

I. Diagnosing Damper Problems
- A. Visual check
  - 1. Misaligned, missing or damaged dampers
  - 2. Press and release sustain pedal
    - a) Lost motion before dampers lift
    - b) Even lifting of dampers
    - c) Proper damper seating upon release of pedal
- B. Aural check
  - 1. Listen for sustained notes while playing
    - a) Staccato notes, chords and runs
    - b) Chords with dampers lifted, then released
  - 2. Check damper felt condition
    - a) Pull back individual dampers and let go
    - b) If the damper makes a sound like a soft hammer hitting the strings, the damper felt is too hard
  - 3. Use "mute bar" to isolate ringing problem
    - a) Mute bar can also be used to lay piano parts on
  - 4. Typical Section Leaks
    - a) Non-speaking sections
      - (1) Back scale or head scale
        - (a) Weave string braid into ringing sections
    - b) Bass section
      - (1) Hardened damper felts?
      - (2) Dampers to small?
    - c) Tenor/low treble section
      - (1) Not enough tri-chords?
    - d) Treble
      - (1) Not enough dampers? Need more than 65 dampers
        - (a) Add to 67 to 70

II. Remedies (short list)
- A. Whole sections ringing
  - 1. Hardened damper felts
  - 2. Dampers too small
  - 3. Too few dampers (67-68 ideal minimum)

4. Poor felt condition/quality
5. Tuning can change damper ringing
6. Any combination of the above

B. Individual notes ringing
   1. Possible problems
      a) Broken spring
      b) Flange pinning
      c) Damper seating/string alignment
      d) Tight guide bushing (grands)
      e) Felt problems
         (1) Contamination/felt damage
         (2) Tri-chord required
      f) No follow-through
         (1) Pedal adjustment
         (2) Spoon adjustment

III. Damper Spoon Regulation
   A. Tools
      1. Conventional spoon bending tools do not work for many technicians in many pianos, hence the fear of/reluctance to regulating spoons.
      2. Damper spoon regulation can be easier than most people think.
      3. It is difficult to access the spoons with the action in the piano.
   B. Use of a straight spoon bender is a good option/alternative
      1. Tool accesses spoons from the distal side of the action
      2. Slotted tip fits onto spoon, "cut-out" allows good access
         a) Tilt action back, in piano, focusing on 5 spoons at a time
            (1) Work from bass to treble
         b) Work with action on bench
            (1) Set samples (1st and last of each section)
            (2) Move action to bench, prop up damper lift rail
            (3) Bend spoons so damper lift mimics samples
         c) Check with action in piano

IV. Tri-Chord Dampers
   A. Very effective damping – when working correctly
   B. Typical tri-chord problems
      1. Deformed damper felt
         a) Re-align damper felt with damper felt pliers
         b) Replace tri-chord
      2. One open string
         a) Regulation: bend wires
            (1) Key bushing pliers to hold damper head while bending wire
         b) Asymmetrical cut of damper felt
            (1) Replace felt
            (2) Mitigate by squeezing damper felt and shifting string
         c) String alignment of V-bar (verticals)

(1) Move strings with brass tool
(a) Rod has a sliding weight for tapping
(b) One end has a dimple for fitting over a bridge pin
(c) The other end is straight for moving a wire over

d) Faulty or asymmetrical agraffes
(1) Replace agraffe
(2) Move strings with brass tool

3. Raised damper still mutes string
a) Regulate damper lift
b) Insert string into the split
c) Trim dampers with scissors
(1) Scissors
(a) Don Mannino says if you are paying less than $50 you have the wrong pair of scissors
(b) High quality German hair stylist scissors
(i) Made by hand in 175 steps
(c) Take advantage of embroidery machines & scissors
(i) Look at "Nancy's Notions" catalog
(d) There exists a thin long-nosed scissor for trimming the felts in the piano
(2) Technique
(a) Remove the damper.
(i) To make the replacement alignment easier, clamp the damper lever to the lift rail with a paper clip clamp
(ii) This clamp will orient the damper lever so it is perfectly in line the height with its neighbors
(b) Make a straight cut just below the line that the string makes on the damper felt
(c) Add a slight bevel cut so the cut tips point between the strings
(d) Replace the damper, tighten the screw & remove the clamp

4. "Whooshing" dampers
a) Trim dampers with scissors
b) Sometimes increasing the depth of the split can be an aid

V. Damper Performance
A. Center-Stitched Flat Felts
1. Two piece dampers on longer heads work best
a) Advantages
(1) "self-seating"
(2) Less noise ("oinking")
(3) Enables ½ and ¼ pedaling
b) Lengthen vertical damper heads by gluing on ¾" x10mm basswood (hobby shop)

(1) Convert the dampers to two-piece dampers on longer heads

B. Tri-chord felts
1. More effective and efficient damping
2. 6-8 tri-chords are recommended minimum

C. Bass damper felts
1. Longer is better than shorter: 55mm recommended
a) Tall, "concert" uprights have bass dampers 67 and even 90mm long!
2. Use triple bass dampers for verticals

D. Tenor break dampers
1. Always use tri-chord dampers for lowest tri-chord unisons
2. Add auxiliary over-damper if needed

E. Felt quality
1. Use only pure wool felt
2. Felt must be resilient (springy)
3. Felt must be soft
a) If too soft it will deform
4. Ideal felt density:
a) 0.12-0.15 g/ccm for flats
b) 0.25 g/ccm for wedge cut felts (bass and tri-chords)
c) Use the best felt you can find: you get what you pay for!

VI. Mass vs. Spring Tension

A. Mass has a greater effect on dampening high frequencies
1. Higher mass impedes the higher frequencies
a)
2. Put them on the bass to reduce the higher harmonics

B. Elasticity has a greater effect on low frequencies

C. An efficiently functioning damper system has a proper balance of resilience (springiness) and mass

D. Adding mass to dampers
1. Advantages
a) The farther you press the key, the more force is needed to lift the damper. If the underlever does not have spring on it, once the force is lifted no more force is needed
b) They more effectively damp energy in the higher partials of the vibrating strings
c) They allow the use of a weaker damper spring, which significantly improves touch control at pianissimo key velocities.
d) Adding mass in a vertical will not affect the touch
e) Adding mass can weaken the damper spring, which can be good
f) Clamped-on fishing weights to the wires does not work well
2. Vertical pianos
a) Switch to brass damper blocks (barrels)
(1) Used by Sauter, Seiler and other high-end makers
(2) Greater mass damps higher partials better

(3) Allow for a weaker spring tension -> improved touch sensation
(4) Adds 9 g of mass each
(5) Glue dampers on with PVC-E (key-top) glue

3. Grand pianos: dampers
   a) Add small leads to damper heads
      (1) Insert 6mm diameter x 7mm long leads
      (2) Drill holes on bass side of damper head, 2 per damper
         (a) Use a brad-point drill bit
      (3) Insert leads, secure with a drop of PVC-E glue

VII. Replacing Vertical Dampers
   A. My favorite method, if you can leave the damper levers in the action
      1. Remove old damper felts
      2. Glue on new, lengthened backing boards in tenor and treble
         a) 1/16" x10mm basswood, from a hobby (model) shop
         b) Step down lengths from 50mm in tenor in 5mm increments to 30mm in top treble
      3. Pre-bend damper wires using Bill Spurlock's method
         a) http://www.spurlocktools.com/instructional_pamphlets.htm
      4. Glue on flat felts
         a) Use either hot hide glue, cold hide glue, or fish glue
         b) Access glues from "Lee Valley Tools"
      5. Glue on tri-chords in piano
         a) Pull back damper head
         b) Apply glue
         c) Slide tri-chord down the strings into position
      6. Glue on bass dampers inside piano
         a) Place dampers into position, letting spring tension hold them
         b) Bend damper wires
            (1) Position of damper head on damper
            (2) Even damper lift
         c) Remove dampers, and glue them individually
      7. Fit lowest tenor dampers with over-damper, as needed

VIII. Damper Trap-work Up-Stop
   A. Most pianos have an insufficient up-stop for the damper pedal
      1. Consider the forces at play
         a) A foot pressing down on a pedal can easily exert over 50lb/square inch on the up-stop capstan
            (1) The typical up-stop (key capstan) gets buried in the felt stop, deforming it
            (2) As a result, the damper up-stop rail inside the piano takes the force of the pedaling
      2. Solutions
         a) Steinway uses firm felt of the correct height (hammer felt scraps)

b) Install a large 12mm diameter damper up-stop capstan

c) For the mobile technician, carry thick firm felt on a small wood block

(1) Selection of varying total height

(2) Attach to bottom of key bed with a dab of glue, secure with a screw

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