

THE HISTORY OF THE PIANO

The piano is a musical instrument played using a keyboard. It is widely used in classical and jazz music for solo performances, ensemble use, chamber music, accompaniment, and for composing and rehearsal. Although the piano is not portable and often expensive, its versatility has made it one of the world's most familiar musical instruments. The word piano is a shortened form of pianoforte, the Italian word for the instrument. The Italian musical terms piano and forte indicate "soft" and "strong". The greater the velocity of a key press, the greater the force of the hammer hitting the strings, and the louder the sound of the note produced. Despite the fact that a piano has strings, it is usually classified as a percussion instrument because the strings are struck rather than plucked (as with a harpsichord or spinet). In the Hornbostel-Sachs system of instrument classification, pianos are considered chordophones.

Types

Modern pianos have two basic configurations (with subcategories): the grand piano and the upright piano.

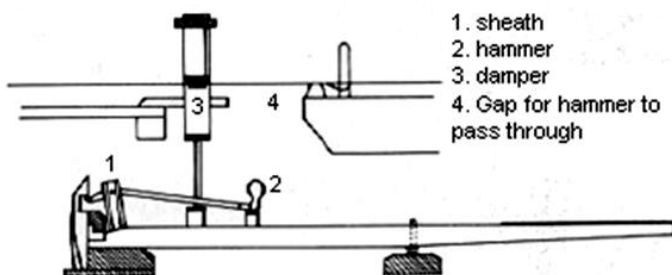


The Parts of the Piano

In order to appreciate how the piano has changed over time, it is useful to understand the general design of the instrument.

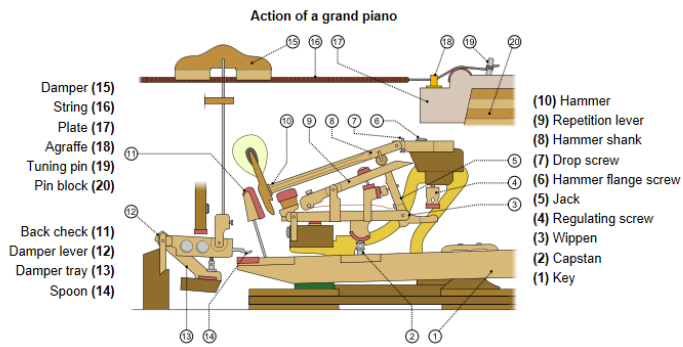
A schematic drawing showing the components of a single note is given in Figure 3. The player presses on a key that is one end of a lever that sets the action into motion. We have not attempted to show the action in any detail in Figure 3; it is a complicated system of levers and axles that transmits the motion of the key lever to the hammer (Giordano, 2010). In normal playing, the piano hammer is propelled toward the string at speeds of typically 1-4 m/s, corresponding to notes ranging from pianissimo to fortissimo. The hammer is released from the action just before it collides with the string, traveling freely when it collides and then rebounds from the string. The use of a hammer to excite the string was what differentiated the piano from other keyboard instruments of the era, most notably the harpsichord.

1786 The Viennese Action



In South Germany they made their fortepianos much lighter than in England. They wanted to have a light and sparkling tone which would be handier for rapid phrases. J.A. Stein, working in Augsburg, developed an action Viennese action to match these characteristics.

1821 Erards Double Escapement



The double escapement was the most important invention of the Sebastian Erard. Before the hammer dropped to its original resting position, it was suspended in such a way that you could re-strike a string without hitting it loud. So suddenly you had one invention that has solved two problems. You could play rapid phrases and repeating notes without a problem and you could create many new aspects in the way you produce a

tone. The double escapement action ultimately became the standard action for grand pianos, used by all manufacturers.

1826 Felt Hammers



Jean-Henri Pape, a Parisian maker came up with the idea to use felt hammers in 1826. The felt hammers were softer and kept to string in tune.

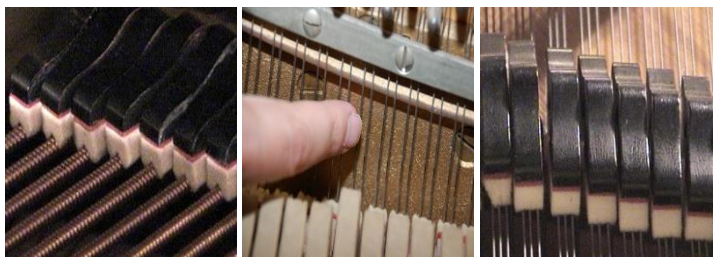
1843 Cast Iron Frame



In 1843 Thomas Edward Chickering has made a concert grand piano with a cast iron frame and Steinways took a step further in developing the grand piano.

1843 Strings

Three strings were used for each note instead two for all but the lower notes.



1844 Sustain Pedal



The sustain pedal was invented in 1844 by Jean Louis Boisselot and improved by Steinways in

1859 Over-Stringing



Over-stringing was invented by Jean-Henri Pape during the 1820s, and first applied to the grand by Henry Steinway Jr. in 1859. After a few developments the treble and tenor strings were placed in parallel to the outer case of the instrument and the bass strings crossed them from the front left to rear right of a grand.

1872 Duplex Scaling



In 1872, Theodore Steinway, permitted the parts of the string near its ends, instead of damping it with a cloth. The string vibrated freely, increased resonance and made the sound richer. That development is called duplex scaling.

The Grand Piano (1870)

The grand piano and upright were matured instrument by 1870. In the next half century a few changes occurred but they focused more on small details in the grand casework. Square pianos were completely replaced by the upright pianos. Today, in the 21st century, pianos come in a variety of different styles, designs, shapes and sizes.

However, despite their differences, they all share the same basic anatomy: keyboard, action, case, soundboard, frame, strings and structure.



From the four-and-a-half-foot small grand to the much larger eight- or 11-foot concert grand, the classic look of the grand piano has remained almost unchanged over the years. The strings run horizontally, perpendicular to the keyboard. Prop open the lid and the grand piano offers unparalleled sound quality that is favored for concerts and large performances. In general, the larger the grand piano, the longer the strings and the greater the timbre or sound quality it produces.

The Grand Piano Case

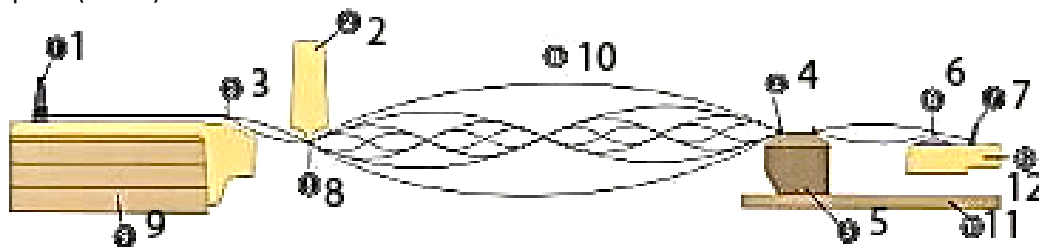
1. Rim, 2. Spine, 3. Tail, 4. Bend Side, 5.

Treble End, 6. Top 7. Front Half, 8. Prop and Half-Prop, 9. Leg, 10. Ferrule, 11. Castor, 12. Lyre, 13. Pedal Feet, 14. Backstays, 15. Fall, 16. Keyslip, 17. Keyblock, 18. Cheek, 19. Music Shelf, 20. Music Desk



Modern Strings

1. Tuning pin, 2. Capo d'astro bar, 3. Front duplex bridge, 4. Rear aliquot, 5. Bridge, 6. Rear duplex bridge, 7. Hitch pin, 8. Front, 9. Pin block, 10. String vibrating pattern, 11. Soundboard, aliquot, 12. Hitch pin plate (frame)

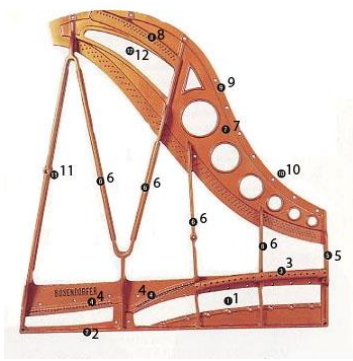


Today's strings are made of high-tensile steel

- The physics of sound require that if the length of a string is doubled and its diameter (gauge) and tension are constant, it will vibrate at the frequency of a note one octave below.
- If the same diameter (gauge) of wire were used by all seven and one quarter octaves, the lowest bass string would need to be 30 feet long. Thus, twenty different gauges of wire are used in a piano.
- To keep the strings to a manageable length, the thickness of the wire gradually increases from treble to bass.
- Once strings increase to a above certain thickness, physics dictates that it becomes stiff and unresponsive. To tackle this problem, strings in the region below middle C are wrapped with copper wiring to increase the strings' mass per unit length without increasing its stiffness.
- Low bass strings are sometimes double wrapped with copper wiring for the same purpose.
- Each string carries a tension of about 160-200 pounds.
- The total pulling stress over the entire set of strings is about 35,000 pounds.

The Cast Iron Frame

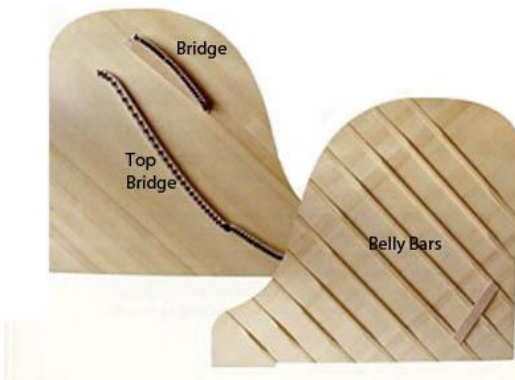
1. Pin block or wrest plank web space, 2. Front flange, 3. Capo d'astro bar, 4. Agraffes, 5. Treble end bar, 6. Stress bars, 7. Web, 8. Hitch pins, 9. Flange, 10. Lag screw hole, 11. Nose bolt hole, 12. Bass registry hole



- The cast iron frame holds the tension of the strings and gives support to the case.
- The frame is cast in sand to eliminate the possibility of "whistling" or vibrating at different frequencies and then sprayed gold or bronze.
- The back structure is made up of large wooden posts that keep the iron frame from twisting due to the tension of the strings
- Spruce is the wood of choice for the back structure as it has a high strength to weight ratios and resist splitting or cracking after it is seasoned.
- The frame is bolted to the back structure around the edge and through a hole in the soundboard.
- Strings are stretched between hitch pins, fitted in the iron frame, which act as anchors for the strings and wrest pins pounded into the pin block made of beech which act as tuning pins that can be turned to adjust the tension of the strings for tuning.
- The pin block is laminated at least seven to eight times to prevent it from splitting and then drilled with 240 holes to accept the tuning pins.

Soundboard

The soundboard is a solid piece of hard wood, most generally spruce, that is carefully chosen for its evenness of grain allowing for even resonance of the vibrating strings positioned above it.



- The strings pass over two bridges affixed to the soundboard defining their sounding or speaking range
- The top bridge, nearest the tuning pins, is either cast in or mounted onto the iron frame
- The sound board itself is slightly domed to resist the down-bearing force of the string through the bridge
- Additional support is given to the soundboard through the presence of carved spruce braces or belly bars, glued to the underside of the soundboard
- These bars are placed at 90 degrees to the board's grain direction and are spaced about 4 inches apart
- The bars are also scalloped at their ends so that the soundboard is not too rigid around the edges allowing freer vibration of the board itself

Piano Hammers



- The head of the hammer is made up of a wooden molding covered in dense, hard felt
- The size of the hammers gradually increase from the bass hammer to the treble hammer
- The shape of the hammer also changes from being more rounded in the bass to being more pointed in the treble
- The felt used to line the hammer heads is one length that is thicker down the middle and tapered toward its sides and glued to the molding
- The point where the hammer strikes the string is called the hammer nose

The piano was likely formed as an attempt to combine the loudness of the harpsichord with the control of the clavichord. Cristofori was able to solve the fundamental mechanical problem of piano design: the hammer must strike the key but not remain in contact with it. That was the problem with the clavichord: the tangent remained in contact with the clavichord string, thus dampening the sound. Additionally, it was imperative that the hammer return to its rest position without bouncing violently, and that the instrument allow one to repeat a note rapidly. Thanks to the work of Cristofori, this was now possible. Many different approaches to piano actions followed, all modeled after Cristofori's piano action. Although Cristofori's early instruments came with thin strings and were much quieter than the modern piano, they were significantly louder and had more sustaining power than the clavichord.

Cristofori's new instrument was known as the pianoforte because it allowed players to produce notes at different dynamic levels by controlling the inertia with which the hammers hit the strings. The original Italian name for the instrument is *clavicembalo (or gravicembalo) col piano e forte* (literally harpsichord capable of playing at the normal level, and more strongly).

Many years after the first version of the piano was created it was still called a harpsichord. This has made it difficult to know this specific aspect of the history of the piano, whether the great composers of the age such as Scarlatti or Vivaldi knew of its existence. The word *pianoforte*, shortened later to *piano*, appeared only in 1732.

The history of the piano – the second half/late eighteenth century

The second half of the eighteenth century was characterized by rapid development of the piano. The instrument was made by a number of manufacturers with a focus on coming up with a more powerful, sustained sound. There were English pianos with a heavier mechanism and louder volume while Austrian pianos had a lighter mechanism and softer timbre. The first pianists began to perform in public on this new generation of pianos produced by Broadwood, Stein, Streicher, Zumpe and Tschudi.

During the late 18th century, piano-making flourished in the Viennese school which included the likes of Johann Andreas Stein and the Viennese makers Nannette Streicher and Anton Walter. Viennese-style pianos featured wood frames, two strings per note, and leather-covered hammers. Some of these pianos came with black natural keys and white accidental keys, the opposite of modern day pianos and keyboards. Wolfgang Amadeus Mozart composed his concertos and sonatas for such instruments. The pianos of the Mozart era had a softer more ethereal tone than today's pianos or English pianos, and had less sustaining power.

1709 Bartolomeo di Francesco Cristofori



It is not known exactly when Cristofori first built his first piano. An inventory made by his employers, the Medici family, indicates the existence of a piano by the year 1700; another document of doubtful authenticity indicates a date of 1698. The three Cristofori pianos that survive today date from the 1720s.

1735 – 1783 The Square Piano - Johannes Zumpe



The pianos in Zumpe's style were built from about 1760 to 1800. They were more compact and affordable than the full-size wing-shaped instrument. By the time the last Zumpe pianos were made, the piano had essentially displaced the harpsichord from its formerly predominant position. The instruments started to gain complexity with the introduction of hand stops, knee levers, swell pedals, as well as more decorative casework.

1745 The Pyramid Piano

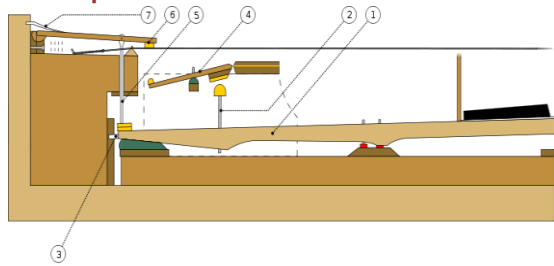


In the Pyramid Piano the strings slanted upward from left to right, and the case above the keyboard took the form of a tall isosceles triangle.

1771 – 1812 John Broadwood – The English Action

John Broadwood has made his first square in 1771. He advanced the square piano with more sophisticated actions, dampers and the replacement of hand stops with pedals. The size of the instruments began to grow to accommodate a greater range of notes and the thickness of the stringing increased bringing much higher tension to the pianos. Metal hitch plates were introduced to alleviate the strain, followed by full metal frames. He added half an octave in the treble, and in later half an octave in the bass. In 1783 he invented the sustaining pedal, which was used by a knee-lever that kept the dampers away from the strings. The action of these small instruments is known as the "English single" and is unusually simple. The action is illustrated below.

Action parts:



- (1) key
- (2) jack; a wire with leather stud on top
- (3) whalebone rear guide, projects from the end of the key, works in a groove to keep the key steady
- (4) hammer; strikes the string to produce sound
- (5) whalebone jack
- (6) damper; when in lowered position stops the sound of the string
- (7) whalebone damper spring

1798 The Giraffe Piano



The giraffe piano was invented in Vienna and first appeared around 1798. It was mechanically like a grand piano, but the strings ran vertically up from the keyboard rather than horizontally away from it, making it a very tall instrument.

1785 Upright Grand



This piano was a grand stood on end, fitted with cupboard doors and bookshelves. It had some good years until the 1820's. Early upright grand pianos had the strings rising straight up from the keyboard. From the end of the 18th century, however, manufacturers started to bring the whole broad end of the grand almost down to the ground.

1828 The Cottage Piano



Robert Wornum has made The Cottage piano in order to create a smaller upright piano.

1863 The Player Piano (Pianola)



In 1863, Henri Fourneaux invented the player piano, which is a piano that records a performance using rolls of paper with perforations, and then replays the performance using pneumatic devices without the need for a pianist.