Fig. 1

Wiring Double-Neck Electric Guitars

By Helmuth Lemme

The idea of building stringed instruments that have two or more necks is already very old; such models existed in the 19th century or perhaps earlier. Of course, these instruments were purely acoustic, a tradition that persists in the many double-neck acoustic guitars built in our days, but most of them are equipped with built-in pickups, though.

A one of a kind instrument by luthier **Philipp Neumann**, from Leipzig, Germany, is shown in Fig. 1, above. It has a normal fretted fingerboard with six nylon strings , a fretless fingerboard with five nylon strings, and twelve diagonal resonating steel strings. Each group is picked up separately and then mixed.

The first purely electric instruments with multiple necks were Hawaiian guitars and had up to four fingerboards. Double-neck guitars for normal playing position showed up in the 1950s, e.g. by Gibson. The best known model is the EDS-1275, a double-neck version of the SG model. Several other manufacturers offer stock models today; furthermore, there are innumerable single items that are completely made by luthiers according to the musician's specifications. Nearly all have solid bodies. A very unconventional construction was the Guild "Crossroads," a connection of a twelve-string acoustic and a six-string solid-body guitar (Fig. 2 - on next page).

The most frequent combination is six- and twelve-string guitars. Less frequently, one finds a six-string guitar and four-string bass (like the headless guitar/bass on the cover of this magazine). Since the only limit is the imagination, many other configurations occur: twelve-string guitar and four-string bass; two six-string guitars (with different tunings); six-string guitar and a mandolin's neck with four, six, or eight strings; fretted and fretless bass (four, five, or six strings each), etc.

Three necks are rare; however, a three-neck model was produced in series by the Korean manufacturer Career. The Hamer company built a one-of-a-kind, five-neck guitar for the guitarist **Rick Nielsen** from the rock band Cheap Trick. This monster has a very high weight and is hard to play, but it undoubtedly accomplishes its "show effect" objective.

Standard Wiring

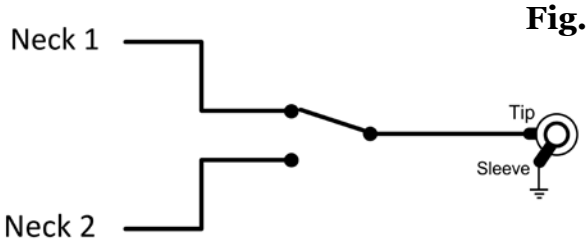
Most models have only one jack output and are connected to the amplifier by a single-core shielded cable. They have the usual controls (volume and/or tone) plus a neck selector switch to select each neck separately or both at the same time.

Fig. 2

However, the latter possibility proves itself problematic for two reasons: 1) While one is playing on one neck, the unplayed strings of the other neck vibrate and can be heard, and 2) The pickups of the unplayed neck are connected in parallel to those of the played neck, acting as an electrical load. The output voltage sinks to half as is the effective inductance: the sound becomes quieter and brighter.

Therefore, it is better to have a neck selector switch with only two positions (fig. 3) to activate one neck or the other but never both at the same time.

Fig. 3



A single-pole/double-throw switch is needed for this—a component that is not available as a guitar spare part but rather in the electronic trade. Fig. 4 shows two models of stable, high-quality switches.

The sound settings on the amplifier, however, may satisfy one neck but not the other. Thus, one has to adjust the amp controls when changing necks.

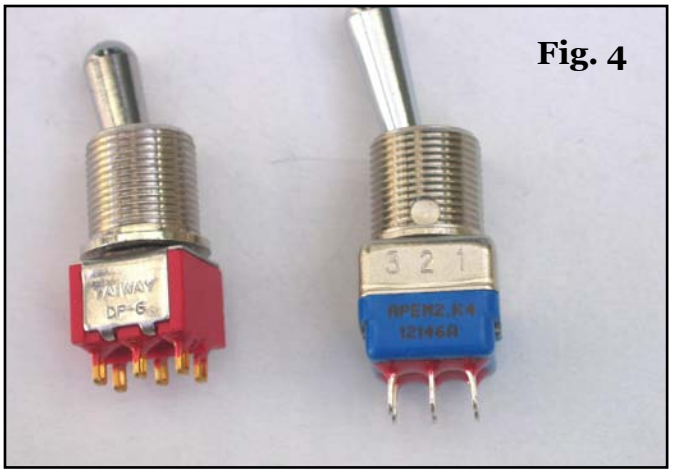


Fig. 4

This is, of course, inconvenient. A solution would be to have an amplifier with preset configurations, changeable with a foot switch: for example, having a lead or crunch sound for a six-string guitar neck and a clean sound for a twelve-string guitar neck or a bass neck (a distorted twelve-string sounds terrible!) One only would have to flip the neck switch on the instrument and the foot switch of the amplifier simultaneously.

Separate wirings and two cables

If the sound qualities required for both necks cannot be achieved with one amplifier then we need two amps and a so-called A/B switch. But there is a problem: most A/B-switches alternate between the signal paths, but the ground contacts are always firmly connected to each other (fig. 5a). If the grounds of two amplifiers are connected to each other, then a "ground loop" is formed: a loud hum comes out from both amplifiers.

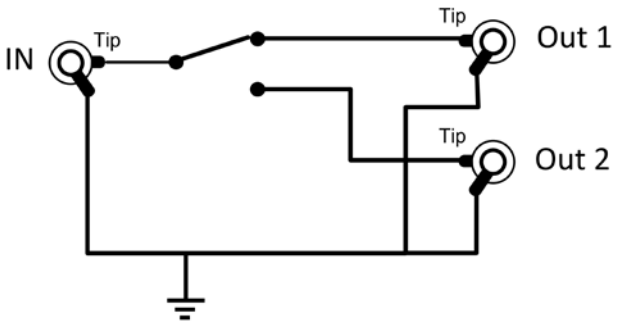


Fig. 5a: *A/B-box for using one guitar with two amps. The cheap solution: the ground line is not switched, risking a ground loop and the consequent hum.*

To avoid this, some people put isolating tape on the protective ground contact of the main's plug of one amplifier. **This is extremely dangerous and not recommended.** A better solution is an A/B-switch of higher quality that switches not only the signal line but also the ground lines (fig. 5b).

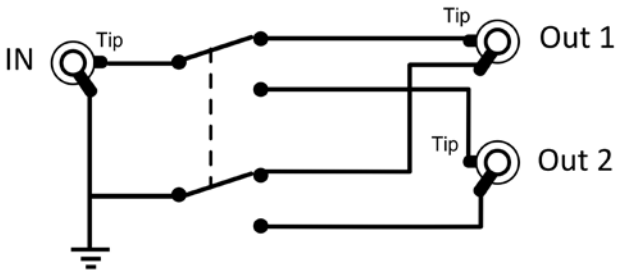


Fig. 5b: *This is the correct solution: the ground line is switched, too. No ground loop, no hum.*

Some musicians don't want to have a foot switch but only want to flip one single switch on the instrument. This wish can be fulfilled rather easily if one uses an amplifier with two input channels. One then needs a stereo jack in the instrument and a Y cable, which has a stereo jack plug at one end and is split up into two individual cables at the other end with separate mono jack plugs each (Fig. 6).

Fig. 6: A "Y" cable, with two mono plugs in one end, and a stereo plug in the other.

These plugs go from the instrument to the two different input channels of the amplifier (fig. 7a). It does not make sense to insert both into the two input jacks of the same channel ("High" and "Low" or "1" and "2"; fig. 7b) because this would be the same as having a mono cable, going back to the hum problem.

Fig. 7a. *Correct connection of a Y-cable to an amp: one plug goes into different channels.*

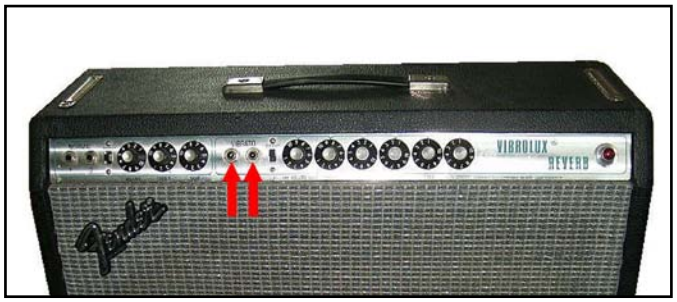


Fig. 7b: *Incorrect: both plugs connected to the jacks of only one channel.*

The neck selector switch on the instrument has to be wired differently: The middle contact goes to ground and the two outer contacts to the signal paths (Fig. 8), so one channel is short-circuited to ground at all times. This is much better because if either signal path is just interrupted, the amplifiers would produce hum and noise with open inputs. A short-circuited input will remain silent instead.

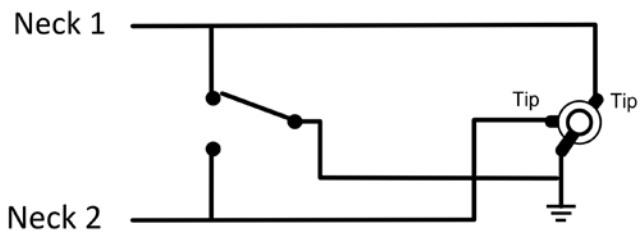


Fig. 8. *Connection of the neck selector switch on a stereo jack: switching off a neck by short-circuiting to ground*

What to do, however, if the player needs to use two separate amplifiers and doesn't want to use a foot switch to select between them? In this case, the ground of both necks must not get in contact with each other. Both wirings must remain completely separated from the other. So one needs two cables (mono) and two jacks on the instrument, and each must be isolated from the other (Fig 9):

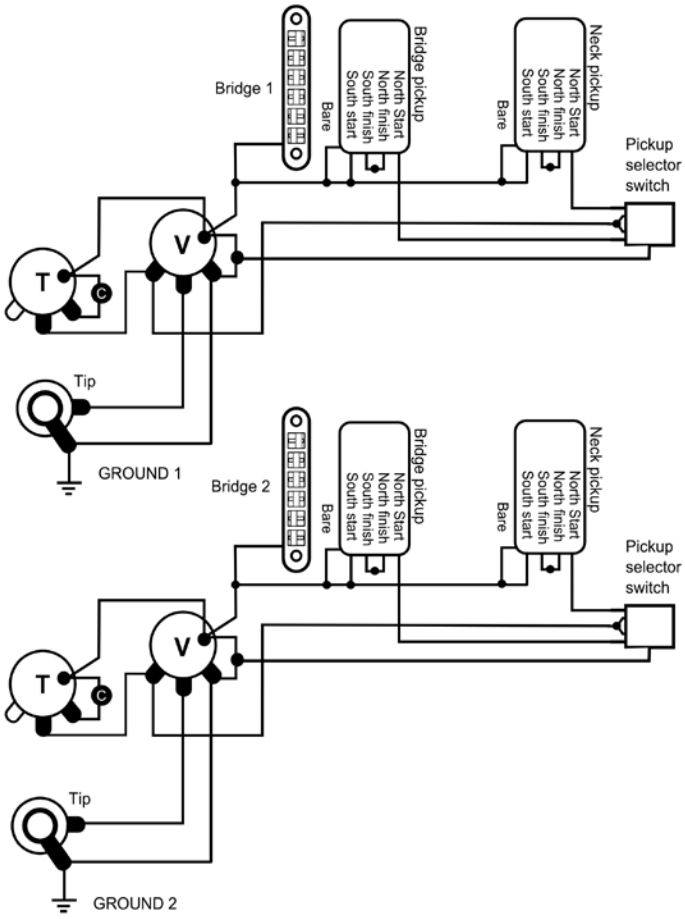


Fig. 9: *Two completely isolated circuits, each with its own ground connection.*

Shielding and Grounding

The question about string grounding still remains. To avoid hum, in many instruments the strings are

Fig.10: *An actual instrument wired with independent circuits. Note that even if the common jack plate is metallic, the independence of the grounds is not compromised, because the jacks themselves are electrically insulated from the plate by plastic rings.*

connected to the wiring's ground using the bridge. But there is a misconception here. If the electrical parts of the instrument are not correctly shielded, there will always be an audible hum, as unfortunately very often happens. In such case, if the player does not touch the strings, they are subject to an alternate electric field emanating from power lines and electric devices in the proximity.

If the player touches the strings and they are grounded, then the player's whole body gets grounded, which works as shielding (at least for electric fields coming from his/her rear). The amplifier then hums no more, or at least much less. This of course is not an elegant method to remove hum. Careful, inner shielding is by far superior. Copper foil works best because one can solder it. Aluminum foil is cheaper and easier to get, but it cannot be soldered. The shielding has to be grounded by contact with the pots, the switches, or the jack. If the shielding is formed by several foils, all must have a good contact with each other; otherwise, the shielding will be incomplete and ineffective.

Conductive spray paints are not as good as metal foils. Those that contain copper are quite useful if one sprays on at least three layers. Each layer has to be totally dry before the next layer is applied. Carbon-containing sprays have still less effect. Zinc spray is completely useless.

If a hum remains despite having inner shielding (a hum that stops when you touch the strings), the culprits are the pickups, which probably are unshielded. Humbucker pickups often have a metal case; the Telecaster's neck pickup has a metal cover, too, which provides an effective shielding. There are also metal-plated covers for single coils with Stratocaster single-coil pickup size. Make sure that the metal cover is soldered to the pickup's ground wire (or to the pickup's metallic chassis). With total shielding, grounding the strings is not necessary. However, pickup metal covers attenuate the treble frequencies, so if the player wants to avoid that effect, then complete and absolute protection against hum is not possible. In this case, string grounding would make sense: you can connect each bridge to the accompanying wiring and shielding, paying attention to a strict electrical separation of both systems. In this case, the neck selector switch must be a double-pole/double-throw switch, connected as shown in fig. 11 below. Have success!

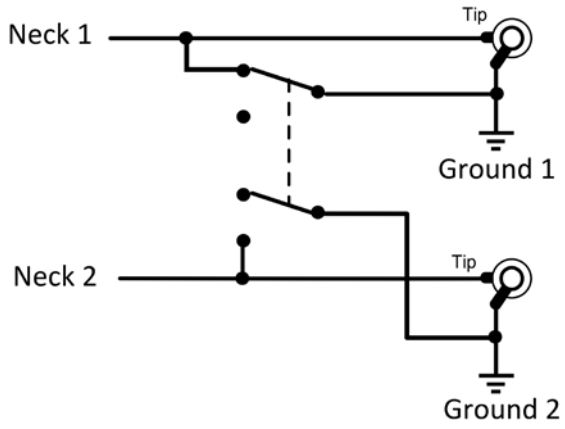


Fig. 11: *Connection of the neck selector switch with two isolated wirings.*

Related links:
http://www.gitarrenelektronik.de