ISOBARIK • LOUDSPEAKER • LINN • UK

Linn Isobarik

Setting out to conquer the world with his Linn Sondek turntable, Ivor Tiefenbrun needed a loudspeaker with spectacular bass. He came up with the controversial Domestic Monitor Speaker, better known as the Isobarik. **Steve Harris** tells the story

It's hard now to imagine there ever was a time when Linn Products' only product was a turntable. Or, as many thought of it, *the* turntable. The Isobarik loudspeaker of 1973 was only the company's second introduction, but it was the first big step towards selling complete systems.

In its prime, the Isobarik was loved and hated, aspired to by many and despised by others, because it was central to the creation of the Linn/Naim mystique in the 1970s and early 1980s. Its extended bass could be used to demonstrate the merits of the Linn turntable, and its power-hungry nature could help sell the benefits of Naim amplification.

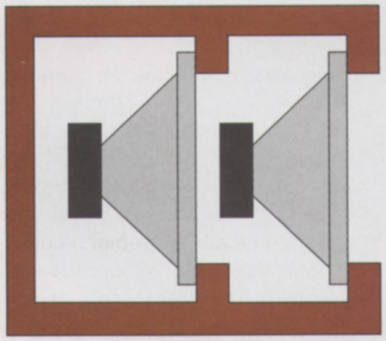
DOWN TO DC...

Here's how Linn's founder and driving force Ivor Tiefenbrun explained the genesis of the Isobarik, in a 1981 interview:

'When I used to demonstrate our turntable at exhibitions, people would see the bass speaker cone move in and out, and say, "Ah, rumble." But I used to suggest that the cone will move at its own fundamental resonance in sympathy with anything that happens.

'So I began to design a speaker that would go down to DC and have no fundamental bass resonance. And that is how our Isobarik (constant pressure) system came along.'

RIGHT: An imposing classic, this is the Linn Isobarik in its final form, with side panels to the stand screening the external crossover, whether this was passive or Aktiv in design. Production of the speaker continued until 1992



LEFT: Cut-away diagram of the isobaric principle showing the 'face-to-back' arrangement of two bass units, as used in Linn's original Isobarik speaker. Detail of the 1974 patent is seen opposite

Essentially, the idea was to use two bass units, mounted one in front of the other, with a small sealed chamber between them, both driven in phase by the music signal.

Ivor Tiefenbrun filed a patent application for 'Improvements In Or Relating To Loudspeaker Systems' on January 26th 1974.

As it happens, in 2011 Linn has launched the Majik Isobarik, the work of a design team led by Philip Budd. This is the first new full-range Linn speaker since the Keltic to use an Isobarik bass section, and it applies the principle in a different way. But as Philip Budd explains, the main advantage is the same.

'The principal benefit of the isobaric [or Isobarik] principle is that by doubling the moving mass [two cones and two coils], doubling the motor strength, and doubling the stiffness [two surrounds, two spiders] we can produce the same

low frequency extension from half the cabinet volume compared to a non-isobaric system employing the same driver type.

'Ivor's patent doesn't cover the isobaric loading principle [originally proposed by Harry Olson in the 1950s]. Instead it covers an arrangement whereby the two drivers used in the isobaric system both point towards the front, one behind the other. In Olson's proposal the drivers were installed either face-to-face or back-to-back.

'A further benefit of the Olson approach is an application of symmetry to the drivers. Any conventional bass unit is essentially non-symmetrical. The force required from the motor to push the cone forward is slightly different from the force required to pull it inward. Mounting the drivers either face-to-face or back-to-back enforces symmetry on the suspension system of the compound driver pair and thereby reduces distortion.

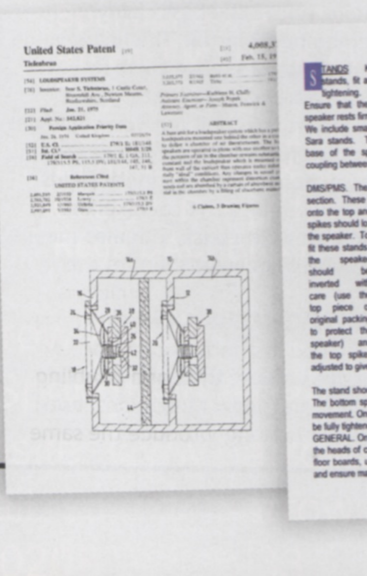
COSMETICS FIRST

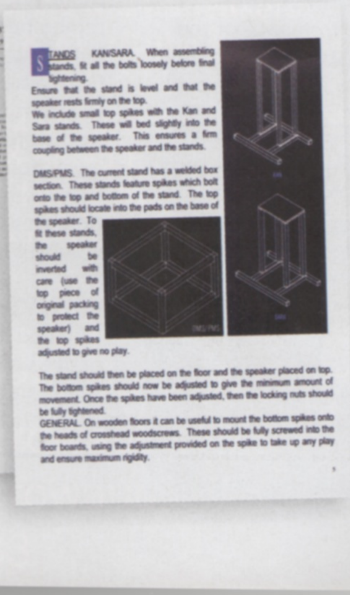
'It seems counter-intuitive that we would have implemented the Isobarik [face-to-back] design, back in the day. But there is an obvious benefit to the Linn patented approach from a product point of view: the customer sees the front face of the outer drive unit rather than its less attractive back side.

'This could be avoided by mounting the bass drivers back-to-back. Unfortunately, though, the isobaric principle breaks down if the distance between the two cones becomes too great, as the air volume trapped between the two cones may start to exhibit wave motion and cease to be equal-pressure [isobaric].

LEFT: An unusual combo from the Hi-Fi@Home feature in the January 2008 issue of *HFN* sees Isobariks powered by a Krell KSA-200 power amplifier. Replacing the original foam, which disintegrated long ago, are smart cloth grilles custom-made by The Listening Rooms

RIGHT: This front-on view emphasises the unusual width (343mm) of the Isobarik cabinet, dictated by the dimensions of the oval KEF B139 bass unit. But thanks to the Isobarik system, the outer bass unit behaved as if the cabinet was much bigger


United States Patent


STANDS KAN/SARA. When assembling stands, fit all the bolts loosely before final tightening.
Ensure that the stand is level and that the speaker rests firmly on the top.
We include small top spikes with the Kan and Sara stands. These will bed slightly into the base of the speaker. This ensures a firm coupling between the speaker and the stands.

DMS/PMS. The current stand has a welded box section. These stands feature spikes which bolt onto the top and bottom of the stand. The top spikes should locate into the pads on the base of the speaker. To fit these stands, the speaker should be inverted with care (use the top piece of original packing to protect the speaker) and the top spikes adjusted to give no play.

The stand should then be placed on the floor and the speaker placed on top. The bottom spikes should now be adjusted to give the minimum amount of movement. Once the spikes have been adjusted, then the locking nuts should be fully tightened.
GENERAL. On wooden floors it can be useful to mount the bottom spikes onto the heads of crosshead woodscrews. These should be fully screwed into the floor boards, using the adjustment provided on the spike to take up any play and ensure maximum rigidity.

BELOW: This Linn speaker owner's manual also covered the smaller Sara and Kan models. Stands of appropriate heights for each of the three models are shown here

'So the depth of the bass driver motor assemblies, if arranged back-to-back, seriously limits the effectiveness of an isobaric system.'

While the patent provided theoretical justification, the speaker itself seems to have been developed in a very down-to-earth way. The Isobarik simply used all the KEF drivers that would be found in two KEFKIT 3 kits, the essential feature being the use of two B139 bass units in each enclosure.

Obviously, only one bass unit was visible, along with a conventionally-arranged mid and treble unit in line above it on the wide front baffle, but a second midrange and a second tweeter were mounted on top of the cabinet, facing upwards.

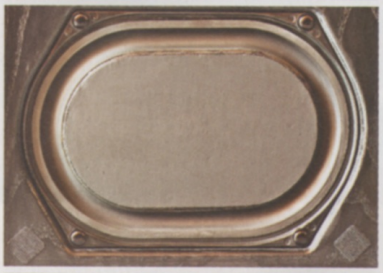
SPARE PARTS?

Cynical observers might suspect that maybe this was done as much just to make some use of the spare drive units from the kits as for any better reason. But the dispersion from the top-mounted units gave the Isobarik a sound that seemed unusually spacious, though it couldn't be accused of delivering pinpoint stereo imaging.

According to KEF's spec, the free-air bass resonance of the B139 bass unit was 25Hz, ±5Hz. In a speaker system the frequency would be higher than this, depending on the cabinet design. But in the Isobarik, the two units together gave a lower fundamental resonance, which was also very well damped. Unlike many big speakers of those days, the Isobarik could play the lowest bass guitar notes cleanly and give an impression of unlimited bass extension. The price to be paid was simply that the Isobarik needed twice as much power.

> 'The Isobarik was central to the Linn/Naim mystique in the '70s and '80s'

'When we first built one of these speakers, we thought that we had failed,' said Ivor. 'Then, after about an hour, we heard a knocking noise and realised that the amplifier could not deliver its rated power at 10Hz. We had been expecting more bass: what we were getting was more ⊖



LEFT: By the mid-1980s, the Bextrene-coned KEF B110 had been replaced with the version seen here

CENTRE LEFT: The flat face of the instantly-recognisable KEF B139 bass unit. It had nominal dimensions of 13x9.25in

LOWER LEFT: Another neat set of custom grilles. Those for the speaker tops need to have enough clearance for the drive unit fixings

fidelity but over-taxing the amplifier.' But, he added, 'When we found a suitable amplifier, we were away.'

This amplifier, of course, came from Naim, which launched its original NAP200 in 1973, replacing it with the long-lived and now classic NAP250 in 1975.

CABINETS AND DRIVERS

Martin Dalgleish is now commercial director of Simple Audio but he previously had a long and distinguished career at Linn. He remembers arriving at the company when the first Isobariks had just been made. The earliest cabinets were made in-house, cutting the pieces on metal-working machines. Martin started work on building them, but was also responsible for showing the speaker to dealers.

Later, the design was smartened up and the cabinets were built for Linn by the Glasgow furniture maker Leon Levin. Originally, the upward facing KEF T27 tweeter had been in front, with the B110 midrange behind, but these positions were soon reversed.

'There were two versions of the T27,' recalls Martin, 'the plastic moulded one, and then the one with a steel plate on the front, which was effectively the front plate of the magnet, which had the dome glued on to it. But it was incredibly fragile, and loads got damaged, and it didn't sound very good. So we needed to find something better.'

So Linn quickly switched from the KEF models to the Danish-made ScanSpeak D2008 tweeter. When Oscar Wrønding of ScanSpeak started making his own Hiquphon tweeters, Linn began using those.

'At the time the Isobarik was designed, Bose 901s were all the rage'

As in the KEFKIT, the midrange unit was the KEF B110 of type SP1003, a 110mm or 5in unit, which, when first launched in 1967, was the world's first commercially-available Bextrene-coned driver. Although the cone was normally damped with plastiflex, Linn modified the performance of the B110 by adding its own bituminous damping coating. In 1984, though, KEF updated the B110 with a new polypropylene cone, and with this type the addition of damping was no longer necessary.

One great advantage of the B139's oval shape was that it could pass through its own mounting aperture in the cabinet, making it possible to install or remove the inner bass unit without having to dismantle the cabinet. For the Sara of 1978, an otherwise more conventional speaker using circular units with an Isobarik chamber, a rather complicated mounting ring had to be designed.

'Originally the Isobarik DMS crossovers were built inside, at a point where you couldn't remove them, above the bass cavity,' remembers Martin. 'The first change I made was to move them into the first bass cavity, so that if you took the front bass unit out you could get to the crossover. Then, to get them away from all the magnetic fields, they went into the cavity in the bottom at the back. This also meant you could convert them to active.'

ACTIVE VERSIONS

Linn had first introduced the active version, the Isobarik PMS (for Professional Monitor Speaker) in 1977. Along with other leading

RIGHT: In 1978, Linn responded to demand for a smaller speaker with the Sara (Small Acoustic Reproduction Apparatus), a simpler design that still used the Isobarik bass principle

HOW LINN WENT ONE BETTER THAN KEF

In the 1950s, the word 'loudspeaker' often meant just what we'd now call a drive unit, and enthusiasts expected to build their own enclosure. In the stereo era of the 1960s and early 1970s, ready-made hi-fi was booming, but you still could save a lot of money by buying the drive units and other electrical bits and doing the woodwork yourself.

With KEF speaker kits you got a complete baffle assembly with the drive units and crossover already mounted and tested, along with wire, connectors, damping material, grille cloths and badges. If you followed the instructions you could end up with something as good as KEF's complete speakers. The KEFKIT 3 [pictured above], a kit version of the KEF Concerto, used a classic combination of three famous KEF drive units. It contained the oval or racetrack-shaped B139 bass unit, with its flat-faced expanded-polystyrene diaphragm, the B110 110mm Bextrene coned midrange unit and the plastic-domed T27 tweeter. So what could be better than a KEFKIT 3? As far as Linn was concerned, the answer was two KEFKIT 3s, which provided the original ingredients for the Isobarik.

manufacturers at the time, Linn believed that active speakers were the way forward. Some dealers did in fact sell active Isobariks with Meridian amplification instead of Naim, but this was never such a successful combination.

In 1988, the passive Isobarik crossover was redesigned and made external to the speaker. Now, whether you chose the passive option or went for the new Aktiv system, the crossover would be placed in the stand and concealed there by side panels. Since the same speaker was supplied for both kinds of system, the distinction between DMS and PMS speakers disappeared, and the DMS name was dropped.

TAMING THE TREBLE

That final passive crossover was the first major project for another speaker designer, Philip Hobbs, who joined Linn in 1986 after working there earlier while a student, and who's now well known as a recording producer for Linn Records.

'I tried to apply some more scientific crossover theory to it, instead of the rather empirical approach that had been used before,' he says. 'But it's actually very hard to design a good crossover, from a classical theory point of view, when you've got two lots of treble units pointing in different directions.

'You've got to remember that at the time the Isobarik was designed, Bose 901s and things were all the rage, people were starting to work on how you might actually manage

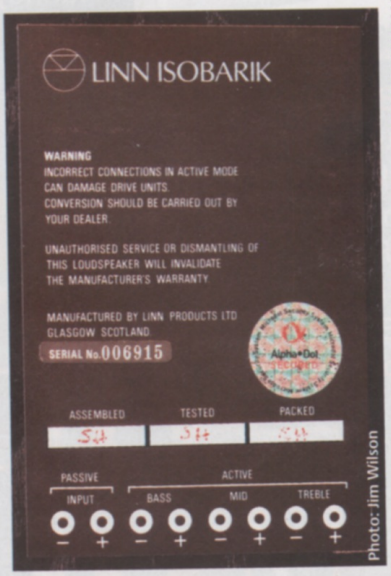


Photo: Jim Wilson

the dispersion of loudspeakers, rather than make the assumption that the 30° that tends to happen out of most loudspeakers by default was the right thing.

'What you do end up with is that it's exceedingly well dispersed. And in more places than not, this greater dispersion works to your benefit. Imaging might not be the thing that comes most easily to mind, but it fills the room very well and for vocals and so forth the quality you get off it tends to be much better than that from a single drive unit.'

But the Isobarik's upward firing drive units weren't repeated when Linn launched the Keltic in 1991. For a time it seemed this would be the last full-range Linn speaker to feature the isobaric principle, although this was also used in the Melodik subwoofer. With the Klimax range, launched in 2002, Linn moved on to electronically-controlled servo bass systems.

NOT ONLY LINN...

Since then, some other manufacturers, notably Neat and Wilson Benesch, have used the isobaric principle. But they've usually put the two bass units face-to-face, as indeed Philip Budd has done in the new Majik Isobarik.

'Acoustically, it's the best arrangement, even though

LEFT: Isobarik, 2011 style: with the new Majik Isobarik, Linn has matched its high-tech K2 mid/treble driver combination to a pair of bass units in Isobarik configuration, down in the base of the speaker

ABOVE RIGHT: Linn's founder, Ivor Tiefenbrun, receives a 1990 Forward Trust Award from the Trust's Bob Wyatt

BELOW LEFT: Rear panel connections on late PMS models could be used with either Aktiv (active) or passive external crossovers. Early Isobarik DMS models used XLR sockets for speaker lead connection

aesthetically it is the worst,' he says. 'So where does this lead us? To the Majik Isobarik and the use of a hidden bass system.

FULL BENEFIT

'I wanted to get the full benefit of the isobaric principle, with reduced cabinet dimensions for greatly extended bass as well as the potential reduction in bass distortion...

'The best way to achieve this was to mount the bass system on the underside of the cabinet and then clothe the exposed back-side of the bass driver within a grille.'

There will be much more to tell about the Majik Isobarik, yet the old DMS/PMS monster still inspires affection. It may be big and cumbersome, and no less cranky in its old age than it ever was, but for many loyal users the original 'Barik' still has something magic too.

LINN ISOBARIK TIMELINE

1973	Introduction of Linn Isobarik DMS speaker
1974	Ivor Tiefenbrun applies for UK patent covering Linn's isobaric speaker principle
1975	US patent application filed
1976	Improved cabinet styling adopted
1977	Linn Isobarik PMS active version introduced
1978	Cabinet damping improved
1978	Linn Sara speaker launched, using Isobarik's bass loading principle
1979	Isobarik midrange unit now vented
1980	Hiquphon tweeter replaces Scanspeak
1980	Linn Kan speaker introduced, using Isobarik's mid and treble units
1984	Isobarik crossover circuit board redesigned
1987	Crossover moved to lower rear compartment
1988	New passive crossover, new Aktiv crossover. Crossover accommodated in stand
1988	DMS discontinued, as PMS could now be used with passive or Aktiv crossover
1991	Linn Keltik introduced, using Isobarik's bass loading principle
2002	Keltik discontinued
2011	Majik Isobarik speaker launched