United States Court of Appeals
for the Federal Circuit

**CHICAGO BOARD OPTIONS EXCHANGE,
INCORPORATED,**
Plaintiff-Appellee,

v.

INTERNATIONAL SECURITIES EXCHANGE, LLC,
Defendant-Appellant.

2013-1326

Appeal from the United States District Court for the Northern District of Illinois in No. 07-CV-0623, Judge Joan H. Lefkow.

Decided: April 7, 2014

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Before RADER, *Chief Judge,* REYNA and WALLACH, *Circuit Judges.*

REYNA, *Circuit Judge*

This patent case, involving systems for trading financial instruments, is before us on appeal for the second time. Defendant-Appellant International Securities Exchange, LLC ("ISE") argues that the district court erred in making certain pretrial rulings that led ISE to stipulate to non-infringement and in finding claim 2 indefinite. We affirm the lower court's judgment of non-infringement because none of its pretrial rulings were in error. Because the specification discloses an algorithm for "matching" on a "pro rata" basis, we reverse the finding that claim 2 is indefinite.

BACKGROUND

ISE asserted U.S. Patent No. 6,618,707 ("'707 Patent") against Plaintiff-Appellee Chicago Board Options Exchange Inc. ("CBOE") in the Southern District of New York. Subsequently, CBOE filed suit in the Northern District of Illinois seeking a declaratory judgment of non-infringement. The New York case was transferred to Illinois.

The '707 Patent generally discloses an "automated exchange" for trading financial instruments. Claim 1 recites:

An automated exchange for trading a financial instrument wherein the trade may be one of a purchase of a quantity of the instrument and a sale of a quantity of the instrument, the exchange comprising:

an interface for receiving an incoming order or quotation to trade the instrument, the incoming order or quotation having a size associated therewith;

book memory means for storing a plurality of previously received orders or quotations to trade a corresponding plurality of quantities of the instrument, the previously received orders and quotations each having a size associated therewith and the previously received orders including public customer orders previously entered for public customers and professional orders or quotations previously entered for one or more professionals;

system memory means for storing allocating parameters for allocating trades between the incoming order or quotation and the previously received orders and quotations; and

processor means for allocating portions of the incoming order or quotation among the plurality of previously received orders and quotations in the book memory means based on the allocating parameters in the system memory means,

wherein the allocating parameters include parameters for allocating a first portion of the incoming order or quotation against previously received customer orders and allocating a remaining portion of the incoming order or quotation preferentially against professional orders and quotations with larger size.

'707 Patent at col. 29, l. 53 – col. 30, l. 14. Claim 2 adds:

The exchange according to claim 1, wherein processor means further comprises means for matching the remaining portion with professional orders or quotations in the book memory means on a pro rata basis.

Id. at col. 30, ll. 15–19. This court's previous opinion described the claimed invention:

The '707 Patent, titled "Automated Exchange for Trading Derivative Securities," discloses an invention that relates generally to markets for the exchange of securities. '707 Patent, col. 1 ll. 13–14. In particular, the '707 Patent is directed to an automated exchange for the trading of options contracts that allocates trades among market professionals and that assures liquidity. *Id*. col. 1 ll. 14–17. The Patent distinguishes an "automated" exchange from the traditional, floor-based "open-outcry" system for trading options contracts. *Id*. col. 1 ll. 24–26.

In an open-outcry system, trading takes place through oral communications between market professionals at a central location in open view of other market professionals. *Id*. col. 1 ll. 27–29. For example, an order is typically relayed out to a trader standing in a "pit." *Id*. col. 1 ll. 29–30. The trader shouts out that he has received an order and waits until another trader or traders shouts back a two-sided market (the prices at which they are willing to buy and sell a particular option contract), then a trade results. *Id*. col. 1 ll. 30–34.

The '707 Patent builds on this traditional exchange system. Specifically, the Patent purports that "[i]t is an advantage of the invention to provide an automated system for matching previously entered orders and quotations with incoming orders and quotations on an exchange for securities,

which will improve liquidity and assure the fair handling of orders."

Chicago Bd. Options Exch., Inc. v. Int'l Sec. Exch., LLC, 677 F.3d 1361, 1363–64 (Fed. Cir. 2012).

CBOE's accused product is the "Chicago Board Options Exchange," which uses the Hybrid Trading System ("Hybrid"). The Hybrid system includes a fully screen-based trading system called "CBOEdirect." The Hybrid system integrates CBOEdirect with traditional, open-outcry trading. The previous panel noted that "CBOE has described the Hybrid as an integrated single market system that blends the elements of open-outcry and electronic execution." *Id*. at 1365.

In 2011, CBOE moved for summary judgment that, among other limitations, Hybrid lacks an "automated exchange." The district court denied the motion. On appeal, this court construed the term "automated exchange" to mean "a system for executing trades of financial instruments that is fully computerized, such that it does not include matching or allocating through the use of open-outcry." *Id*. at 1373. We agreed with the district court that the patentee disavowed all manual or partially automated systems of trading:

> The '707 Patent thus disavows the traditional open-outcry or floor-based trading systems. There is no other way to interpret the listing in the specification of the many reasons why manual and partially automated exchanges cannot sustain the growing demands of the market. Indeed, the specification goes well beyond expressing the patentee's preference for a fully automated exchange over a manual or a partially automated one, and its repeated derogatory statements about the latter reasonably may be viewed as a disavowal of that subject matter from the scope of the Patent's claims.

Id. at 1372 (citing *Honeywell Int'l, Inc. v. ITT Indus., Inc.*, 452 F.3d 1312, 1319 (Fed. Cir. 2006)). Thus, under this court's construction, the claims require a fully computerized trading system that does not include "matching or allocating through the use of open-outcry." While it is undisputed that the Hybrid system includes both computerized and open-outcry features, it is not clear to what extent these features are intertwined. In particular, unresolved in the previous appeal was whether CBOEdirect is a separate system that could, on its own, infringe the '707 Patent or whether is it intertwined with the open outcry aspects of the Hybrid system such that it is not an "automated exchange."

This court also construed "matching" as "identifying a counterpart order or quotation for an incoming order or quotation" and agreed with the district court that "matching" and "allocating" are distinct processes. *Id.* at 1371.

PROCEEDINGS ON REMAND

On remand, the district court made certain evidentiary and other pretrial rulings. ISE stipulated to non-infringement because it felt that the district court's pretrial rulings prevented it from proving that the accused product met the "automated exchange" limitation.

The parties could not agree on a jury instruction regarding the meaning of "automated exchange." After hearing from both sides – including oral argument, written submissions, and a motion for reconsideration from ISE – the court ruled that the jury instruction regarding the "automated exchange" claim limitation would be:

> An automated exchange is a system for executing trades of financial instruments that is fully computerized, such that it does not include matching or allocating through the use of open outcry. Conversely, a system for executing trades of financial instruments that includes matching or allocating

> through the use of open outcry is not an automat-
> ed exchange.

The first sentence above is a direct quotation of this court's construction, while the remaining text was added by the district court. In the same order, based upon the "automated exchange" claim construction and what it knew about the accused product, the district court identified the factual issue that remained for the jury:

> Presumably, ISE will argue that CBOEdirect infringes because it is an automated exchange, *i.e.*, a system for executing trades of financial instruments that includes automated matching or allocating (even though it permits matching or allocating through open outcry for some trades). CBOE will argue that CBOEdirect is not an automated exchange because it does not provide that all matching or allocating be done automatically. Because CBOEdirect is a computerized trading system with a floor-based component for matching and allocating some trades through open outcry, *it will be a jury question whether CBOEdirect is a stand alone automated exchange alongside a floor-based system or whether it is a system that includes matching or allocating through open outcry.*

(emphasis added). Thus, the district court recognized that ISE would argue that CBOEdirect infringed but also recognized that ISE would have to address the degree to which CBOEdirect was integrated with the open-outcry aspects of Hybrid. When ruling on CBOE's Motion in Limine No. 1, the court elaborated on the factual infringement question for the jury:

> ISE expects to demonstrate that, although CBOEdirect may route orders to the floor, CBOEdirect also matches and allocates without the use of open outcry; thus, CBOEdirect is an automatic exchange.

> The issue for trial is whether Hybrid is merely two independent exchanges, one an "automatic exchange" (CBOEdirect) and the other open outcry on the trading floor, or whether it is an integrated system that requires interaction with the trading floor. As such, ISE will have the burden to demonstrate (1) that each element (*e.g.*, interface, book memory means and processor means) of one or more claims is present in CBOEdirect, and (2) that Hybrid's "rule-based order routing algorithm" does not include matching or allocating through open outcry. This is necessary because the '707 patent disavows floor based trading. In other words, ISE must prove that Hybrid is a system for executing trades of financial instruments that is fully computerized, such that it does not include matching or allocating through the use of open outcry.

> ISE may offer evidence that the elements of the claims of the '707 patent are found in CBOEdirect but it may not argue that, therefore, CBOEdirect infringes or that Hybrid's algorithm that includes routing orders to the trading floor is irrelevant.

(footnote omitted). Again, the court recognized the importance of whether CBOEdirect includes the open-outcry aspects of Hybrid.

CBOE also moved in limine to exclude certain portions of ISE's expert testimony. Ruling on this motion, the district court noted that "the invention of the '707 patent does not encompass Hybrid unless ISE can also establish that [Hybrid] is actually two independent trading systems." The court restated its view of "the issue for trial" as "whether Hybrid is actually two independent exchanges, one an 'automatic exchange' (CBOEdirect) and the other open outcry on the trading floor or whether it is an integrated system that requires interaction with the

trading floor." The court then ruled that ISE's expert, Dr. Marvin, "may testify but may not express an opinion that CBOEdirect infringes unless ISE can show that the system of CBOEdirect is independent of floor-based trading."

At a pre-trial hearing, the parties and the court again discussed the interplay between Hybrid and CBOEdirect as it related to proof of infringement. The court stated: "it seems to me that the accused system is Hybrid. However, if CBOEdirect is an independent exchange so that it can operate without the [trading] floor, then there could be infringement if all the elements of infringement are proved." It went on to state: "the patented process is a system for executing trades. Hybrid is a system for executing trades. And these are the two apples that we're going to compare" and "I don't know what more I can say about that that I think the accused system is Hybrid."

The district court also found that claim 2, a computer implemented means-plus-function claim, was indefinite because the specification failed to disclose an algorithm for performing the recited function.

In view of the district court's rulings in limine and its description of the factual issue for trial, ISE concluded that it could not prove that the accused system met the "automated exchange" claim limitation. As such, ISE stipulated to non-infringement. Based upon this stipulation, the court entered final judgment and ISE appealed. We have jurisdiction under 28 U.S.C. § 1295(a)(1).

DISCUSSION

The District Court's Pre-Trial Rulings

ISE argues that the district court erred by "holding that" Hybrid is the accused product and "precluding ISE from accusing CBOEdirect of infringement." The district court, however, did not preclude ISE from arguing that CBOEdirect infringes the '707 Patent. In fact, on more

than one occasion, the district court said just the opposite: "if CBOEdirect is an independent exchange so that it can operate without the [trading] floor, then there could be infringement if all the elements of infringement are proved" and "ISE expects to demonstrate that, although CBOEdirect may route orders to the floor, CBOEdirect also matches and allocates without the use of open outcry; thus, CBOEdirect is an automatic exchange." While the court did refer, on occasion, to Hybrid as the accused product, it clearly recognized that ISE could prove its infringement case if it showed that CBOEdirect, by itself, was the claimed automated exchange. For example, the court identified "the issue for trial" as "whether Hybrid is actually two independent exchanges, one an 'automatic exchange' (CBOEdirect) and the other open outcry on the trading floor or whether it is an integrated system that requires interaction with the trading floor." It also noted that "it will be a jury question whether CBOEdirect is a stand alone automated exchange alongside a floor-based system or whether it is a system that includes matching or allocating through open outcry." Thus, the court did not preclude ISE from accusing CBOEdirect of infringing. Rather, it expressly invited ISE to show that CBOEdirect was independent of the open-outcry aspects of Hybrid, as required by this court's construction of "automated exchange."

ISE also argues that, by requiring it to prove that CBOEdirect was independent from, or not integrated with, Hybrid, the district court improperly added additional limitations to this court's construction of "automated exchange." ISE argues that it should have "no burden to prove 'independence' or to disprove 'integration' . . . or to mention Hybrid at all; rather, it must prove only that CBOEdirect is 'a system for executing trades of financial instruments that is fully computerized, such that it does not include matching or allocating through the use of open-outcry.'" ISE argues that requiring it to prove that

CBOEdirect is not integrated with Hybrid or the trading floor violates the mandate rule. *See, e.g.*, *Del Mar Avionics, Inc. v. Quinton Instrument Co.*, 836 F.2d 1320, 1324 (Fed. Cir. 1987) ("[P]rior findings and the claim construction based thereon are the law of the case. They are not available for redetermination.").

The district court correctly framed the factual issue remaining for the jury by requiring ISE to show that CBOEdirect did not include open-outcry. ISE recognizes that, in order to prove infringement, it must show that CBOEdirect is "a system for executing trades of financial instruments that is fully computerized, such that it does not include matching or allocating through the use of open-outcry." As noted above, CBOEdirect is a part of the larger Hybrid trading system. The Hybrid system does utilize, at least to some extent, "matching or allocating through the use of open-outcry." Thus, ISE must demonstrate that CBOEdirect is separate from the open-outcry aspects of Hybrid. The district court recognized this unresolved factual issue on more than one occasion. ("The issue for trial is whether Hybrid is merely two independent exchanges, one an 'automatic exchange' (CBOEdirect) and the other open outcry on the trading floor, or whether it is an integrated system that requires interaction with the trading floor."); (noting "the issue for trial" as "whether Hybrid is actually two independent exchanges, one an 'automatic exchange' (CBOEdirect) and the other open outcry on the trading floor or whether it is an integrated system that requires interaction with the trading floor"). We hold that, because this factual issue was unresolved in the previous appeal, the trial court did not violate the mandate rule by allowing this unresolved issue to go to the jury. *See, e.g.*, *Del Mar Avionics,* 836 F.2d at 1324.

Indefiniteness of Claim 2

Claim 2, a computer-implemented means-plus-function claim, recites:

> The exchange according to claim 1, wherein processor means further comprises *means for matching* the remaining portion with professional orders or quotations in the book memory means on a pro rata basis.

'707 Patent at col. 30, ll. 15–19. (emphasis added). The parties agree that the claimed function is precisely what the claim recites: "matching the remaining portion with professional orders or quotations in the book memory means on a pro rata basis." As noted, this court previously construed "matching" as "identifying a counterpart order or quotation for an incoming order or quotation" and agreed with the district court that "matching" and "allocating" are distinct processes. *Chicago Bd.*, 677 F.3d at 1371.

Relying on *Aristocrat Techs. Australia Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008), the district court found that claim 2 was indefinite because the specification did not disclose a step-by-step algorithm for performing the claimed function. *Aristocrat* and related cases hold that, for means-plus-function claims, the corresponding structure in the specification must be a step-by-step algorithm, unless a general purpose computer is sufficient for performing the claimed function. *Aristocrat*, 521 F.3d at 1333 (requiring disclosure of an algorithm); *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999) (same); *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 518 (Fed. Cir. 2012) (same); *In re Katz Interactive Call Processing Patent Litig.*, 639 F.3d 1303, 1316 (Fed. Cir. 2011) (finding that disclosure of a general purpose computer is sufficient corresponding structure for the means-plus-function claims at issue).

Such an "algorithm" may be expressed "in any understandable terms including as a mathematical formula, in prose, or as a flow chart, or in any other manner that

provides sufficient structure" to a person of ordinary skill in the art. *Finisar Corp. v. DirecTV Grp., Inc.,* 523 F.3d 1323, 1340 (Fed. Cir. 2008) (internal citation omitted); *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1313 (Fed. Cir. 2012) ("When the specification discloses some algorithm, on the other hand, the question is whether the disclosed algorithm, from the viewpoint of a person of ordinary skill, is sufficient to define the structure and make the bounds of the claim understandable."). We must also remember that "a challenge to a claim containing a means-plus-function limitation as lacking structural support requires a finding, by clear and convincing evidence, that the specification lacks disclosure of structure sufficient to be understood by one skilled in the art as being adequate to perform the recited function." *Budde v. Harley-Davidson, Inc.*, 250 F.3d 1369, 1376–77 (Fed. Cir. 2001).

We find that claim 2 is not indefinite because the specification discloses an algorithm for matching the remaining orders on a pro rata basis. First, "matching" itself is not indefinite, having been construed by this court as "identifying a counterpart order or quotation for an incoming order or quotation." *Chicago Bd.*, 677 F.3d at 1371. The remaining question then is whether the specification discloses an algorithm for "identifying a counterpart order" on a pro rata basis.

"Pro rata" means in proportion. The summary of the invention explains that pro rata assignments in the '707 Patent are made based upon order size. *See* '707 Patent at col. 4, ll. 60–64 ("[A]n incoming order is filled first against public customer orders and then filled against professional orders and quotations on a pro rata basis based on the size of the professional order or quotation."). The specification specifically describes matching the "remaining" portion of orders on a size-based, pro rata basis, as recited in claim 2:

The *remainder* of the order is filled by the professionals, PRO #1 and PRO #2 on a *pro rata basis*. Although PRO #1 has time priority, PRO #2 has a greater size, so his share is computed first. PRO #2 has 20 out of the 30 contracts of the orders placed by the two professionals at the lowest offer and is entitled to 66% of the 6 remaining contracts, or 4 contracts. The remaining 2 contracts are traded by PRO #1.

. . .

In this case, PRO #1 and PRO #2 have the same size, which is greater than PRO #3. Because PRO #1 has time priority over PRO #2, PRO #1 *gets matched first*. PRO #1 has 40% of the orders among the professionals (20/50) and is entitled to 15 contracts, leaving 21 contracts. PRO #2 has now has the largest size and 66% of the size at the highest bid (20/30) and *is matched* for 14 contracts, leaving 7 contracts. PRO #3, the last remaining professional, trades the balance of 7 contracts.

Id. at col. 18, ll. 1–8; col. 18, l. 63 – col. 19, l. 4 (emphases added). Thus, the specification explains that orders are matched in proportion to the size of the order requested by the professional. It also explains that, if the order sizes are equal for two professionals, the professional who placed the first order, gets matched first. Based upon this discussion of size-based, pro rata matching, a person of ordinary skill in the art would understand the algorithmic structure for performing the claimed function.

The specification discusses using a similar pro rata process to allocate orders. *See, e.g.*, '707 Patent at col. 16, ll. 57–67. At times, the discussion of pro rata allocation and the discussion of pro rata matching somewhat overlap. *See, e.g., id.* at col. 18, l. 61 – col. 19, l. 4 (stating that the contracts are "allocated" on a pro rata basis before

describing "matching" contracts on a pro rata basis). According to CBOE, because this court construed allocating and matching as distinct processes, any discussion of pro rata *allocating* cannot provide structure for pro rata *matching*. It may be correct that, if the specification disclosed only pro rata allocation, there would not be sufficient structure for the claimed pro rata matching function. But this is not the case. As outlined above, the specification outlines an algorithm for matching on a size-based, pro rata basis. The disclosure of pro rata allocation does not detract from the disclosure of pro rata matching. Indeed, a person of ordinary skill in the art would likely look to the similar pro rata allocating process when implementing pro rata matching. Additionally, simply because the pro rata aspects of allocation and matching may be similar, or even the same, does not mean that the overall processes are no longer "distinct." As an example, two distinct calculation processes may both use addition but remain distinct overall.

The district court erred in finding that there was clear and convincing evidence that the specification did not disclose sufficient structure such that a person of ordinary skill in the art would know how to match on a pro rata basis. While it is true that the specification also discusses pro rata allocating, this does not detract from the disclosure of pro rata matching such that claim 2 is indefinite. Accordingly, we reverse the district court's decision that claim 2 is indefinite.

AFFIRMED-IN-PART AND REVERSED-IN-PART

COSTS

Each party shall bear its own costs.