

**IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS**

NORTHWESTERN UNIVERSITY,

Plaintiff,

v.

YASKAWA ELECTRIC CORPORATION
and YASKAWA AMERICA, INC.,

Defendants.

Case No. 1:21-cv-00603

JURY TRIAL DEMANDED

COMPLAINT FOR PATENT INFRINGEMENT

1. Plaintiff Northwestern University brings this action for infringement of U.S. Patent Numbers 6,928,336, 6,907,317, and 7,120,508 (collectively the “patents at issue”), which claim groundbreaking intelligent assist systems in the field of collaborative robotics. Northwestern demands a trial by jury on all issues so triable and, for its complaint against defendants Yaskawa Electric Corporation and Yaskawa America, Inc. (collectively the “Yaskawa Defendants”), alleges as follows:

THE PARTIES

2. Northwestern is a private, not-for-profit institution of higher education and research organized and existing under the laws of Illinois, with a principal place of business at 633 Clark Street, Evanston, Illinois, 60208. Northwestern is the owner and assignee of the patents at issue.

3. Yaskawa Electric Corporation is a Japanese corporation with a principal place of business at 2-1 Kurosakishiroishi, Yahatanishi-ku, Kitakyushu 806-0004, Japan.

4. Defendant Yaskawa America, Inc. is an Illinois corporation with a principal place of business at 2121 Norman Drive South, Waukegan, Illinois, 60085.

JURISDICTION AND VENUE

5. This lawsuit is an action for patent infringement arising under the patent laws of the United States, Title 35, of the United States Code.

6. This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

7. Yaskawa Electric Corporation is subject to jurisdiction in the United States, and specifically in Illinois, under Fed. R. Civ. P. 4(k)(2). Yaskawa Electric Corporation has contacts with the United States that include, *inter alia*, advertising, offering to sell, and/or selling its products and software throughout the United States, including in Illinois and this District.

8. This Court has personal jurisdiction over Yaskawa America, Inc. because, among other things, Yaskawa America, Inc. is an Illinois corporation that, having availed itself of Illinois' corporate laws, is subject to personal jurisdiction in Illinois.

9. This Court has personal jurisdiction over both Yaskawa Defendants in that they have, directly or through their agents and/or intermediaries, committed acts within Illinois giving rise to this action and/or have established minimum contacts with Illinois such that the exercise of jurisdiction would not offend traditional notions of fair play and justice.

10. In particular, on information and belief, the Yaskawa Defendants, directly and/or through their agents and/or intermediaries, make, use, import, offer for sale, sell, and/or advertise their products and affiliated services in Illinois. For example, by maintaining a sales presence and physical location in this District.

11. Further, on information and belief, the Yaskawa Defendants have placed, and continue to place, infringing products into the stream of commerce, via an established distribution channel, with the knowledge and/or understanding that such products are sold in the United States including in Illinois and specifically including this District.

12. On information and belief, the Yaskawa Defendants have derived substantial revenue from their infringing activity occurring in Illinois and within this District and/or should reasonably expect their actions to have consequences in Illinois.

13. In addition, the Yaskawa Defendants have knowingly induced, and continue to knowingly induce, infringement within this District by advertising, marketing, offering for sale, and/or selling devices containing infringing functionality within this District to at least resellers, distributors, customers, and/or other end users, and by providing instructions, user manuals, advertising, and/or marketing materials that facilitate, direct, or encourage the use of infringing functionality with knowledge thereof.

14. The Yaskawa Defendants have committed patent infringement in Illinois that has led to foreseeable harm and injury to Northwestern.

15. Venue is proper in the Northern District of Illinois under 28 U.S.C. §§ 1391 and 1400(b) because the Yaskawa Defendants either maintain a place of business in the District or are foreign corporations that may be sued in any judicial district. Moreover, a substantial part of the events and omissions giving rise to the claims at issue occurred in this District, including sale of the infringing products.

16. Venue over Yaskawa Electric Corporation is proper in the Northern District of Illinois under 28 U.S.C. §§ 1391(c)(3) and 1400(b) because Yaskawa Electric Corporation is not resident in the United States and may thus be sued in any judicial district.

17. Venue over Yaskawa America is proper in the Northern District of Illinois under 28 U.S.C. § 1400(b) because Yaskawa America resides in Illinois.

BACKGROUND

I. Northwestern University

18. Northwestern is a world-renowned research university that fosters and creates important progress in engineering and applied science. Each year, Northwestern is ranked as one of the most innovative universities in the U.S. and in the world.

19. Northwestern is home to nearly 1,500 research laboratories across two campuses in the Chicago area. Northwestern's research laboratories are at the cutting edge of research in many fields, including medicine, biomedical research, engineering, materials and industrial processes, software, and therapeutics.

20. Much of the research at Northwestern, like the research that led to the patents at issue in this case, requires significant funding, and is financed by various public and private sources. The knowledge obtained through Northwestern's research benefits many people and organizations around the world, including educators, researchers, employers, employees, and consumers.

21. To maximize those benefits, Northwestern sometimes patents and/or commercializes inventions made by its faculty and researchers, and then returns a portion of the proceeds of those activities to fund further education and research at the University.

22. Over the past 15 years, the United States Patent and Trademark Office has awarded hundreds of patents to Northwestern, thereby recognizing the many discoveries made by its faculty and staff. These patents span numerous fields and disciplines. Many are based on groundbreaking research done at the Robert R. McCormick School of Engineering and Applied Science.

23. Established in 1909, the McCormick School of Engineering is one of twelve constituent schools at Northwestern. The McCormick School of Engineering offers Doctor of

Philosophy (Ph.D.) and Master of Science (M.S.) programs and houses some of the nation's top researchers and brightest students. There are more than 207 full-time faculty on staff at the McCormick School of Engineering, which budgets more than \$1.5 billion a year for its research efforts and currently ranks 4th in the United States in industrial manufacturing and systems engineering, according to U.S. News & World Report.

24. One of the faculty members at the McCormick School of Engineering is Dr. Michael A. Peshkin, who is a Professor of Mechanical Engineering and Breed Senior Professor of Design. Dr. Peshkin is also a fellow of the National Academy of Inventors and a recipient of a number of teaching and educator awards.

25. Dr. Peshkin is a frequent collaborator with Dr. J. Edward Colgate. Dr. Colgate is also a Professor of Mechanical Engineering at the McCormick School of Engineering and the recipient of numerous awards and recognitions in the field of mechanical engineering.

26. Drs. Peshkin and Colgate are the inventors on a broad class of intelligent assist devices known as collaborative robots or "cobots." Cobots are programmable robotic manipulators and assist devices that can safely interact with human operators in a shared workspace. Prior to the invention of the cobot in the laboratory of Drs. Peshkin and Colgate, the word "cobot" did not exist. Now, according to the Wall Street Journal, the word is one "you'll need to know" for the "glossary of the future."

II. Cobots

27. Drs. Peshkin and Colgate presented the first academic paper on cobots at the Proceedings of the IEEE International Conference on Robotics and Automation in April of 1996. The paper, titled "Nonholonomic Haptic Display," won the Best Conference Paper award.

28. The first patent applications covering first-generation cobots were filed in 1996 and 1997 and resulted in the issuance of United States Patent Nos. 5,923,139 and 5,952,796, respectively.

29. First-generation cobots were passive devices that assured safe human-robot interactions by having no internal source of motive power and more limited range of motion, accomplished through the use of nonholonomic joints and transmission elements that created programmable constraints.

30. Drs. Peshkin and Colgate, along with others, developed a second generation of intelligent assist devices. Unlike first-generation cobots, these computer-controlled devices could be either active or passive, and used sophisticated sensors, controls, and motor technology to allow human operators to position loads with greater degrees of freedom, speed, precision, and ease. And importantly, these new devices contained a modular architecture of programmable components coordinated through digital communication links that allowed for the creation of bespoke intelligent assist devices able to adapt to a variety of applications.

31. Work on these second-generation intelligent assist devices is protected by numerous United States patents, including the patents at issue in this case.

32. The patents at issue, U.S. Patent Nos. 6,928,336, 6,907,317 and 7,120,508, disclose an architecture, configuration system, and multi-functional hub for intelligent assist systems. These patents are attached as Exhibits 1-3.

33. The patents at issue are the result of the work of all named inventors on intelligent assist systems with a modular architecture. The importance of these contributions to the design and creation of cobot systems, as disclosed and claimed in the '336, '317, and '508 patents, was

widely recognized in the engineering community, including by industrial robotics manufacturers such as the Yaskawa Defendants, whose products incorporate Northwestern's innovations.

III. The Yaskawa Defendants' Infringing Products

34. Yaskawa Electric Corporation is a multi-national manufacturer of industrial robots and solutions for factory automation that conducts business throughout the world through a number of subsidiaries.

35. On information and belief, Yaskawa Electric Corporation conducts business in the United States through its wholly owned subsidiary, Yaskawa America.

36. Collectively the Yaskawa Defendants design, develop, manufacture, market, and sell industrial robots intended to be used in collaboration with humans as part of its Motoman Robots product line, including the Smart Series, EP Series, GP Series, HC Series, HP Series, MotoMini Series, PH Series, SDA Series, MH Series, SIA Series, MPK Series, MPL Series, PL Series of robots, and the Smart Pendant, TP100 teach pendant, DX200, smartPanel, PanelPC, MPiec, YRC1000, YRC1000micro, DX200, DX100, FS100, MLX100, and NX100 controllers, panels and/or pendants (the "Accused Products").

37. On information and belief, the Yaskawa Defendants began commercial marketing the EPX Series, SDA Series, and SIA Series systems in 2008.

38. On information and belief, the Yaskawa Defendants began commercial marketing of the DX100 controller in 2009.

39. On information and belief, the Yaskawa Defendants began commercial marketing of the FS Series and MPP Series systems and the FS100 controller in 2011.

40. On information and belief, the Yaskawa Defendants began commercial marketing of the MH Series systems in 2014.

41. On information and belief, the Yaskawa Defendants began commercial marketing of the DX200 controller in 2015.

42. On information and belief, the Yaskawa Defendants began commercial marketing of the Smart Pendant in 2018.

43. The Yaskawa Defendants are involved in the sale and/or importation into the United States of cobot systems, including but not limited to the systems and architecture for providing modular intelligent assist systems and hubs for modular intelligent assist systems. The Yaskawa Defendants' cobot systems embody and/or use the patented systems, configuration systems, and multi-function hub at issue in this case.

44. On information and belief, the Yaskawa Defendants designed, developed, made, and sold infringing cobot systems despite having knowledge of the Northwestern patents at issue based, at a minimum on their receipt of a letter from Northwestern's counsel notifying the Yaskawa Defendants of their infringing conduct.

FIRST CAUSE OF ACTION

(Infringement of the '336 Patent)

45. Northwestern incorporates by reference its allegations in Paragraphs 1-44 as if fully restated herein.

46. On August 9, 2005, the United States Patent and Trademark Office lawfully issued the '336 patent, entitled "System and Architecture for Providing a Modular Intelligent Assist System." All rights, title, and interest in and to the '336 patent have been assigned to Northwestern, which is the sole owner of the '336 patent.

47. The '336 patent is valid and enforceable. The invention of the '336 patent addressed concerns specific to cobots—the need for natural and intuitive control of a payload by a human operator through easy and safe interactions with a powered robot. The '336 patent improved on

the first generation of cobots by, among other things, claiming a novel modular architecture for a cobot that allows for wide flexibility and variability.

48. The Yaskawa Defendants have directly, literally under 35 U.S.C. § 271(a), and/or equivalently under the doctrine of equivalents, infringed the '336 patent, by making, using, selling, and/or offering to sell in the United States, and/or importing into the United States, without license or authority, the Accused Products.

49. The Accused Products meet each and every element of one or more claims of the '336 patent. By way of illustration only, the Yaskawa Defendants' Accused Products meet each and every element of claim 1 of the '336 patent.

50. Independent claim 1 of the '336 patent recites:

An intelligent assist system having a modular architecture, comprising:

a motion module for supporting and moving a payload;

a plurality of computational nodes, at least one of the plurality of computational nodes being configured to control the motion module; and

a plurality of communication links, at least one of the plurality of communication links being between two of the plurality of computational nodes to carry information between the nodes to actuate the motion module.

51. As depicted below and described on the Yaskawa Defendants' Smart Series website, the Yaskawa Defendants describe the Accused Products as intelligent assist systems. For example, they describe the Smart Series as "a new generation of robotics" designed to be work side-by-side with human operators in a safe way. By way of further example, the Yaskawa Defendants describe the HC Series cobots as designed for safe interaction for "tasks that require it to work in close proximity to humans."

About Collaborative Robotics

Modes of Robot Collaboration

A collaborative robot is designed to work with a human operator, positioned near them in a shared workspace. For example, the operator may perform the first part of a task while the cobot finishes the rest.



Safe

Reduces risk

- Advanced pinchless geometry
- Power and force limiting with Functional Safety Unit
- Innovative through-arm utilities

The Yaskawa human-collaborative robot (HC10) is a new generation of robotics that is capable, affordable, versatile, easy to use and built with the industrial strength for which Yaskawa is known. These robots are for customers looking for easy automation, meaning an industrial robot to automate tasks that require it to work in close proximity to humans.

See, e.g. About Collaborative Robotics: Modes of Robot Collaboration, available online at <https://smart.motoman.com/en-us/resources/about-collaborative> (last visited January 27, 2021) (Exhibit 4); Smart Series: The Smart Choice for Easy Automation, available online at <https://smart.motoman.com/en-us> (last visited January 27, 2021) (Exhibit 5).

52. The Yaskawa Defendants' Accused Products have a modular architecture comprising at least one articulated robot arm, a control box, and a pendant, as depicted below with regard to each of the Accused Products. This architecture allows for programming, re-programming, user-friendliness, and customization to allow greater flexibility and additional automation of the intelligent assist device.

Smart Series:



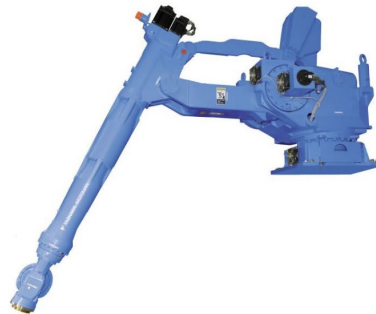
See, e.g. Exhibit 5.

53. In the Yaskawa Defendants' Accused Products, the articulated robot arm comprises a motion module, or alternatively is comprised of multiple motion modules, each of which contain at least one actuator. The robot arm can support and move a payload, as described below from the Industrial Robotic Systems page of the Yaskawa website.

EP Series:

EP4000D and EPH4000D robots feature a 200 kg payload, a 3,505 mm horizontal reach and 2,629 mm vertical reach. These robots can achieve 12 strokes per minute with a press pitch of 6.5 m. Extended reach allows these robots to service presses with press pitches of up to 9 m. Slender design of the robots allow work in tight spaces and service multiple presses.

Applications: Press Tending			
 200.0 kg Payload	 DX100 Controller	 3505 mm Horizontal Reach	 2614 mm Vertical Reach



See Industrial Robotic Systems, available online at <https://www.motoman.com/en-us/products/robots/industrial> (last visited January 27, 2021) (Exhibit 6).





GP Series:

Ideal for high-speed assembly and handling applications, the GP7 robot is fast, compact and efficient. Offering the highest payload, fastest speed and highest wrist allowable moment in its class, this robot is controlled with the YRC1000 controller and can be programmed with the lightweight standard teach pendant or the easy-to-use touchscreen [Smart Pendant](#).

The GP-series robots offer improved acceleration/deceleration control for all robot positions resulting in overall improved productivity. The small footprint, slim arm design allows for minimum installation space and minimizes interference with peripheral devices. This enables the GP-series robots to be placed in close proximity to workpieces and other robots to create flexible, high-density layouts. Installation is quick and efficient. A single cable is all that is needed to connect the manipulator to the controller, resulting in easy setup and reduced expenses for maintenance and spare parts inventory.

The GP7 robot is compatible with the [YRC1000 Controller](#) or the [YRC1000micro Controller](#) as well as the standard teach pendant or the [Smart Pendant](#).

Applications:
Assembly, Material Handling, Part Transfer, Pick and Pack, Pick and Place, IP65-67

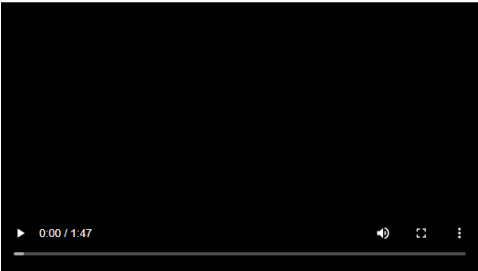
 7.0 kg Payload	 YRC1000 Controller	 927 mm Horizontal Reach	 1693 mm Vertical Reach
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Id.

HC Series:

The Yaskawa human-collaborative robot (HC10) is a new generation of robotics that is capable, affordable, versatile, easy to use and built with the industrial strength for which Yaskawa is known. These robots are for customers looking for easy automation, meaning an industrial robot to automate tasks that require it to work in close proximity to humans.



Applications:
Assembly, Machine Tending, Material Handling, Part Transfer, Pick and Pack, Pick and Place



 10.0 kg Payload	 YRC1000 Controller	 1200 mm Horizontal Reach	 1200 mm Vertical Reach
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Id.

HP Series:

The six-axis HP20D-A80 robot features high-precision drives on major axes and is designed for high-accuracy cutting and dispensing applications. The accuracy of the HP20D-A80 is similar to the larger MC2000 (Master Cut) robot. Path accuracy can be within 0.1 mm depending on the application. Compact design and advanced collision avoidance features with multiple robot control allow up to eight robots (72 axes) to be used together to maximize productivity while minimizing floorspace requirements.

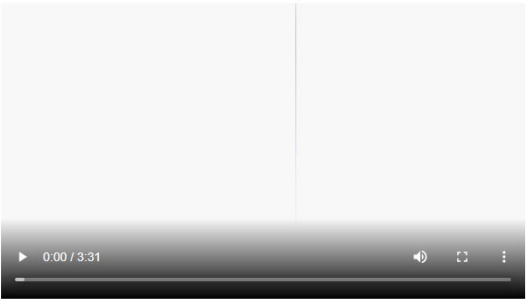
Applications			
Dispensing, Material Cutting/Trimming, Material Removal			
			
20.0 kg Payload	DX100 Controller	1717 mm Horizontal Reach	3063 mm Vertical Reach



Id.

MotoMini Series:

Equipped with the highest acceleration in a small robotic arm, the MotoMini is 20% faster than comparable small robots, reducing cycle time and boosting productivity. Internal cabling and air lines minimize interference with other process equipment, and a variety of mounting options (surface, wall, ceiling, etc.) accommodate high-density factory layouts. Designed for extremely agile, high-speed performance for a wide range of applications, the quiet, compact and precise MotoMini can take your small-part process to the next level.



Id.

PH Series:

Designed for powerful press handling performance, the six-axis PH130RF shelf-mounted robot is a smart choice for "jigless" applications. Built with high-performance drive systems on the S-, L- and U-axes (axes 1, 2 and 3), the PH130RF robot is ideal for high duty cycle applications in the press room. While a large work envelope and high moment of inertia ratings accommodate a variety of parts, fast axis speeds and acceleration capabilities decrease cycle time and optimize production output. A streamlined upper arm provides easy access to parts in confined spaces, and a reduced interference design enables the robot to be placed closer to machines and fixtures, optimizing valuable floorspace.

Applications			
Material Handling, Press Tending			
			
130.0 kg Payload	YRC1000 Controller	3474 mm Horizontal Reach	4161 mm Vertical Reach



Id.

SDA Series:

The SDA5F is a dual-arm, 15-axis robot designed for complex assembly and small part material handling applications. Both arms can work together dramatically simplifying end-of-arm tooling. Designed with patented servo actuators, all cables are routed through the arms. The FS100 is a powerful controller with unmatched open software architecture. Superior dexterity and best-in-class wrist characteristics make slim, dual-arm robot ideally suited for assembly, part transfer, machine tending, packaging and other handling tasks that formerly could only be done by people.








Applications			
Assembly, Machine Tending, Material Handling, Part Transfer			
 5.0 kg Payload	 FS100 Controller	 845 mm Horizontal Reach	 1118 mm Vertical Reach

Id.

MH Series:

The MHJF is a compact robot designed for lighter payload applications such as small parts assembly, material handling and education systems. The FS100 is a powerful controller with unmatched open software architecture.








Applications			
Assembly, Dispensing, Machine Tending			
 2.0 kg Payload	 FS100 Controller	 545 mm Horizontal Reach	 909 mm Vertical Reach

Id.

SIA Series:

The SIA Series best-in-class wrist performance characteristics provides amazing freedom of movement. Its 7-axis actuator-based design and, coupled with ability to maneuver in very tight areas make this versatile robot ideal for a wide range of industrial applications: assembly, injection molding, inspection, machine tending and a host of other operations.







Applications			
Assembly, Machine Tending, Material Handling, Part Transfer, Pick and Pack			
 5.0 kg Payload	 DX100 Controller	 559 mm Horizontal Reach	 1007 mm Vertical Reach

Id.

MPK Series:

The MPK2F and MPK2F-5 are high-performance 5-axis robots designed for high-speed picking and case-packing applications. Ideal for placing product into a deep case. The FS100 is a powerful controller with unmatched open software architecture.

Applications: Palletizing, Pick and Pack			
 2.0 kg Payload	 FS100 Controller	 900 mm Horizontal Reach	 1625 mm Vertical Reach



Id.

MPL Series:

Highly versatile, the MPL80 II robot is ideal for case palletizing, bag palletizing, order picking and many logistical tasks for end-of-line or distribution center automation. Extensive 3,291 mm vertical reach, combined with 2,061 mm horizontal reach, enables palletizing loads up to 95 in. tall. NSF-H1 certified food-grade lubricant option available for food or consumer product packaging environment.





Applications: Palletizing, Pick and Pack			
 80.0 kg Payload	 DX200 Controller	 2061 mm Horizontal Reach	 3291 mm Vertical Reach



Id.

PL Series:

Highly reliable, this high-speed 4-axis robot is well-suited for a range of palletizing applications, as well as order picking and other logistical duties for end-of-line or distribution automation. A performance-driven design with parallel-link construction, heavy-duty bearings and high allowable moment of inertia expertly handles large, unbalanced loads, while extremely fast axis speeds and acceleration capabilities reduce cycle time for increased production output. Internally routed electric cables and airlines maximize reliability, and a 75 mm pass-through on the T-axis enables easy connection to end-of-arm tooling.

Applications: Palletizing, Pick and Pack, IP65-67			
 190.0 kg Payload	 YRC1000 Controller	 3159 mm Horizontal Reach	 3024 mm Vertical Reach



Id.

54. On information and belief, the articulated robot arm, the control box, and the pendant of the Yaskawa Defendants’ Accused Products each contain one or more computational nodes. At least one of the computational nodes is configured to control the articulated robot arm.

The computational nodes further comprise a programmable logic device and execute motion control algorithms, including automatic motion control algorithms. As depicted below, the Yaskawa Defendants advertise that their Accused Products can be programmed to perform multiple tasks in a single setup, that programming/reprogramming a robot is quick, and that software and perception technology has expanded robotic capabilities in recent years.



Robotics can easily scale and adapt to changing demands

1. Up to 4 robots can be added to a single controller to multiply the speed/scale of a task.
2. A robot can be programmed to perform multiple jobs in a single setup – easing transition time, training and space requirements.
3. Programming / reprogramming a robot is typically less time than prepping a conventional setup. [Robot programming](#) has become easier than in the past, and programmers can be more easily found or trained in-house.
4. Software and perception technology has expanded robotic capabilities in recent years – allowing them to perform more tasks than previously possible.

See, e.g. Robotics for Industrial Automation: A Sustainable Path to Profit, available online at <https://www.motoman.com/en-us/about/company/robotics> (last visited January 27, 2021) (Exhibit 7).

55. On information and belief, there are communication links between the computational node(s) of the control box, robot arm, and pendant of the Yaskawa Defendants' Accused Products, including at least one node that actuates the motion module.

56. On information and belief, the Yaskawa Defendants' Accused Products also include various sensors that are embedded in the articulated robot arm. Each sensor is itself a computational node. Examples of such sensors include torque, force, and motion sensors. The presence of these sensors allows the Yaskawa Defendants' Accused Products to work safely with humans. As depicted below, the Yaskawa Defendants' highlight the sensors in their robotic arms:

What are Power and Force Limiting Features?

- **Sensors in each joint** — any value detected by the sensor will be compared to standard state and evaluated in order to perform an action (i.e. stop, move away from the force, etc.)
- **Hand guiding** — easy and intuitive robot path programming by dragging the arm around its working envelope and registering positions and end effector actions
- **Round shaped design** — created to smooth the surface, remove sharp edges from impact dissipation, integrated motors and wiring, pinch point free design to prevent hand squeeze, lightweight
- **Additional safety options** — soft active or passive skin (jacket) for softened impact

See, e.g. Exhibit 4.

57. On Information and belief, the computational nodes on the Yaskawa Defendants' Accused Products are connected to a plurality of communication links. At least one of the communication links carries information between the nodes to actuate the articulated robot arm.

58. In violation of 35 USC § 271(b), the Yaskawa Defendants have been and are indirectly infringing the '336 patent by inducing infringement of this patent by others who use the Yaskawa Defendants' Accused Products.

59. The Yaskawa Defendants' affirmative acts of making, selling, and offering to sell its services and/or products, or components thereof, cause the Yaskawa Defendants' Accused Product to be used in a manner that infringes the '336 patent.

60. The Yaskawa Defendants further provide guidance and instruction to third parties to use the Accused Products in their normal and customary way to infringe the '336 patent.

61. The Yaskawa Defendants specifically intend that their customers infringe the '336 patent. The Yaskawa Defendants perform the acts that constitute induced infringement with knowledge of the '336 patent and with knowledge or willful blindness that the induced acts would constitute infringement.

62. In violation of 35 U.S.C. § 271(c), the Yaskawa Defendants have been and are indirectly infringing the '336 patent by contributing to the infringement of this patent by others, such as the Yaskawa Defendants' customers, in the United States.

63. The Yaskawa Defendants offered to sell and have sold in the United States, and imported into the United States, the Accused Products, which are a material part of the invention of the '336 patent. The Yaskawa Defendants know that the Accused Products are especially made or especially adapted for an infringing use, and not a staple article or commodity of commerce suitable for substantial non-infringing use.

64. The Yaskawa Defendants have had actual notice of the '336 patent no later than May 5, 2020, when counsel for Northwestern sent the Yaskawa Defendants a letter identifying the '336 patent and Accused Products that infringe the '336 patent.

65. The Yaskawa Defendants willfully infringe the '336 patent by deliberately engaging in acts of infringement on an ongoing basis with knowledge of the '336 patent.

SECOND CAUSE OF ACTION

(Infringement of the '317 Patent)

66. Northwestern incorporates by reference its allegations in Paragraphs 1-65 as if fully restated herein.

67. On June 14, 2005, the United States Patent and Trademark Office issued the '317 patent, entitled "Hub for a Modular Intelligent Assist System." All rights, title, and interest in and to the '317 patent have been assigned to Northwestern, which is the sole owner of the '317 patent.

68. The '317 patent is valid and enforceable. The invention of the '317 patent addressed concerns specific to cobots—the need for natural and intuitive control of a payload by a human operator through easy and safe interactions with a powered robot. The '317 patent improves on the first generation of cobots by, among other things, claiming a hub for an intelligent assist system, which controls the systems and helps impart wider flexibility and variability.

69. The Yaskawa Defendants have directly, literally under 35 U.S.C. § 271(a), and/or equivalently under the doctrine of equivalents, infringed the '317 patent, by making, using, selling, and/or offering to sell in the United States, and/or importing into the United States, without license or authority, the Accused Products.

70. The Accused Products meet each and every element of one or more claims of the '317 patent. By way of illustration only, the Yaskawa Defendants' Accused Products meet each and every element of claim 1 of the '317 patent.

71. Independent claim 1 of the '317 patent recites:

A multi-function hub for use in an intelligent assist system, the multi-function hub comprising:

a physical interface configured and arranged to be a central interface point for an operator;

a computational node disposed on the physical interface, the computational node comprising programmable logic for implementing program controlled functions; and

an input/output ("I/O") interface for interfacing with an information network and disposed on the physical interface, the I/O interface being adapted to communicate with the computational node on the physical interface and at least one computational node disposed on the other module via a common data link, and the I/O interface uses a digital communication protocol to communicate with the computational node on the other module via the common data link.

72. On information and belief and as depicted below, the Yaskawa Defendants make, use, and sell several multi-function hubs with a physical interface for use with the Accused Products, including but not limited to the following robot controllers and pendants compatible with the Yaskawa Defendants' infringing robots: Smart Pendant, TP100 teach pendant, DX200, smartPanel, PanelPC, MPiec, YRC1000, YRC1000micro, DX200, DX100, FS100, MLX100, and NX100.

Smart Pendant:



See, e.g. Next-Generation Robot Programming, available online at <https://smart.motoman.com/en-us/products/programming> (last visited January 27, 2021) (Exhibit 8).

DX200 with Pendant:



See, e.g. Yaskawa Motoman Robot Controllers, available online at <https://www.motoman.com/en-us/products/controllers> (last visited January 27, 2021) (Exhibit 9).

smartPanel:

smartPanels – the smartest choice for high usability, performance and connectivity to MPiec controllers.

smartPanels work with any Yaskawa MPiec controller to bring easy user control and connectivity to a medium-sized application. Movicon 11 software gives users a virtually unlimited choice of tags, screens, recipes, alarms, etc.

Quality

- Robust and durable – IP66 protection rating (front)

Functionality




- The smartPanels come with Movicon 11 and Windows Embedded Compact 7, for resource hungry applications

smartPanels in detail

- Slim profile
- Robust housing
- Powerful scripting capabilities

Dial in from anywhere

- VNC-Client software offers dial-in access from any location worldwide

			
smart	H41-71A41-0	H71-71A41-0	HA1-71A41-0
Operating System	Windows Embedded Compact 7		
Runtime	Movicon 11		
Display Size [Zoll]	4.3	7	10
Resolution [Pixel]	480x272	800x480	1024x600
Touch Screen	resistive		
Processor	ARM Cortex-A8 1GHz		
Interfaces	1x RS232/422/485, 1x USB-A, 1x Ethernet		
int. RFID Reader	-		
Work Memory [MB]	512		
Load Memory [GB]	4		
Card Slot	-		
Housing	plastic		
Protection	Front: IP 66 / Rear: IP 20		

See, e.g. HMI: Ready for Reliability Brochure, available online at <https://www.yaskawa.com/delegate/getAttachment?documentId=BL.MTN.03&cmd=documents&openNewTab=true&documentName=BL.MTN.03.pdf> (last visited January 27, 2021) (Exhibit 10).


PanelPC:

Intelligent control and monitoring with PC performance.

The latest performance features and a precise, responsive capacitive touchscreen combine in Panel PC to deliver superlative usability in a small space.

All three models feature Intel Atom processors, large integrated work memory and display resolutions up to full HD in the 21.5" Panel PC. A familiar Windows system environment means users are instantly comfortable with how the system works. The Panel PCs also have many useful interfaces. High quality materials enhance the appearance of your control cabinet.

- Intel Celeron J1900 4 x 2.0 GHz
- High resolution displays deliver up to full HD
- Numerous interfaces for every application need
- Fanless construction
- High-quality metal housing



	67K-RRJ0-EB	67P-RRJ0-EB	67S-RRJ0-EB
Display Size [Zoll]	10.1	15.6	21.5
Resolution [Pixel]	1280x800	1366x768	1920x1080
Touch Screen	Capacitive		
Processor	Intel Celeron J1900 4 x 2.0 GHz		
Interfaces	2x Ethernet 2x RS232/422/485 (SUB-D) 2x USB 2.0 1x USB 3.0 1x VGA 1x Audio out		
Work Memory [MB]	2,048-4,096		
User Memory [MB]	2,048-16,384		
Card Slot	CFast		
Casing	Aluminium		
Protection	front: IP65 rear: IP20		
Operating System	Windows Embedded Compact 7		
Runtime	- Movicon11		

Id.

73. The Yaskawa Defendants' multi-function hubs contain a physical interface configured and arranged to be a central point for a user to interface with the computational nodes of the cobot system, including the control box and the articulated robot arm.

74. On information and belief, the physical interface of the Yaskawa Defendants' multi-function hubs contains at least one computational node.

75. The Yaskawa Defendants' multi-function hubs were designed to master even complex operating tasks easily with an intuitive user interface. As depicted below, the Smart

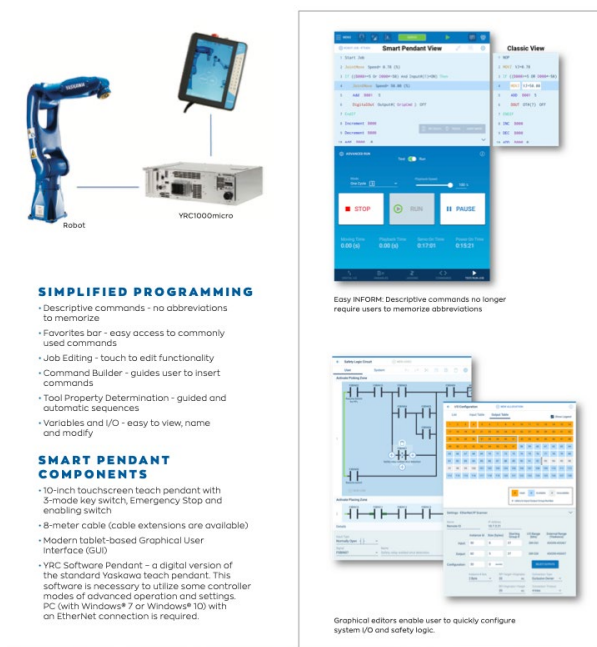
Pendant simplifies programming for easy-to-understand operation and fast implementation of the robot system. And on information and belief, each hub offers suitable programmable logic that can be used to create and implement complex and customized programs for controlling various functions, including motion and tasks to be completed by the robot arm.

Radically Change the Way a Robot is Programmed

Ideal for novice robot users, the easy-to-use touchscreen Smart Pendant simplifies INFORM programming for easy-to-understand operation and fast implementation of the robot system. The Smart Pendant's intuitive Human Machine Interface (HMI) adapts to the programmer's style, and the built-in Smart Frame feature allows the robot to adapt to the operator's position, eliminating the utilization of coordinate frames and allowing for easy robot jogging. Smart Pendant is included with all Smart Series robots.

- Fast, simple learning curve
- Easy troubleshooting and error recovery
- Easy-to-understand operation; intuitive format
- Simplified INFORM programming supports powerful controller functionality
- 10-inch touchscreen, tablet-based interface

76. The Yaskawa Defendants' multi-function hubs contain an input/output interface for interacting with an information network that is disposed on the physical interface of the hub, as depicted below with regard to the YRC1000micro controller and Smart Pendant below.



See Smart Pendant: Simplified Robot Programming, available online at <https://www.motoman.com/getmedia/52e61c70-b36a-46ae-a3a0->

7014d412a9f7/SmartPendant.pdf.aspx?_ga=2.241592386.1188387859.1611780839-666319281.1611780839 (last visited January 27, 2021) (Exhibit 11).

77. On information and belief, the input/output interface on these multi-function hubs is adapted to communicate with the computational node on the physical interface of the hub and at least one computational node disposed on the robot arm or controller through a common data link.

78. On information and belief, the multi-function hubs use a digital communication protocol to communicate via the common data link.

79. In violation of 35 U.S.C. § 271(b), the Yaskawa Defendants have been and are indirectly infringing the '317 patent by inducing infringement of this patent by others who use the Yaskawa Defendants' Accused Products.

80. The Yaskawa Defendants' affirmative acts of making, selling, and offering to sell its services and/or products, or components thereof, cause the Yaskawa Defendants' Accused Products to be used in a manner that infringes the '317 patent.

81. The Yaskawa Defendants further provide guidance and instruction to third parties to use the Accused Products in their normal and customary way to infringe the '317 patent.

82. The Yaskawa Defendants specifically intend that its customers infringe the '317 patent. The Yaskawa Defendants perform the acts that constitute induced infringement with knowledge of the '317 patent and with knowledge or willful blindness that the induced acts would constitute infringement.

83. In violation of 35 U.S.C. § 271(c), the Yaskawa Defendants have been and are indirectly infringing the '317 patent by contributing to the infringement of this patent by others, such as the Yaskawa Defendants' customers, in the United States.

84. The Yaskawa Defendants offered to sell and have sold in the United States, and imported into the United States, the Accused Products, which are a material part of the invention of the '317 patent. The Yaskawa Defendants know that the Accused Products are especially made or especially adapted for an infringing use, and not a staple article or commodity of commerce suitable for substantial non-infringing use.

85. The Yaskawa Defendants have had actual notice of the '317 patent no later than May 5, 2020, when counsel for Northwestern sent the Yaskawa Defendants a letter identifying the '317 patent and Accused Products that infringe the '317 patent.

86. The Yaskawa Defendants willfully infringe the '317 patent by deliberately engaging in acts of infringement on an ongoing basis with knowledge of the '317 patent.

THIRD CAUSE OF ACTION

(Infringement of the '508 Patent)

87. Northwestern incorporates by reference its allegations in Paragraphs 1-86 as if fully restated herein.

88. On October 10, 2006, the United States Patent and Trademark Office issued the '508 patent, entitled "System and Architecture for Providing a Modular Intelligent Assist System." All rights, title, and interest in and to the '508 patent have been assigned to Northwestern, which is the sole owner of the '508 patent.

89. The '508 patent is valid and enforceable. The invention of the '508 patent addressed concerns specific to cobots—the need for natural and intuitive control of a payload by a human operator through easy and safe interactions with a powered robot. The '508 patent improves on the first generation of cobots by, among other things, claiming a configuration system for an intelligent assist system, which allows a human user to interact and use the cobot system.

90. The Yaskawa Defendants have directly, literally under 35 U.S.C. § 271(a), and/or equivalently under the doctrine of equivalents, infringed the '508 patent, by making, using, selling, and/or offering to sell in the United States, and/or importing into the United States, without license or authority, the Accused Products.

91. The Accused Products meet each and every element of one or more claims of the '508 patent. By way of illustration only, the Yaskawa Defendants' Accused Products meet each and every element of claim 1 of the '508 patent.

92. Independent claim 1 of the '508 patent recites:

A configuration system for an intelligent assist system, the intelligent assist system comprising a module, and a computational node on the module, the configuration system comprising:

a host computer system capable of executing a stored program, the host computer system being in communication with the computational node via a communication link;

a graphical user interface enabling the user to manipulate objects related to the module or the computational node; and

a plurality of visual indicators corresponding to a status of the module, the computational node, or the communication link.

93. On information and belief, the Yaskawa Defendants make, use, and sell several configuration systems known as controllers for use with the Accused Products, including but not limited to the MPiec, YRC1000, YRC1000micro, DX200, DX100, FS100, MLX100, NX100, as well as their accompanying panels and pendants, such as the Smart Pendant, TP100 teach pendant, smartPanel, and PanelPC.

94. On information and belief, the Yaskawa Defendants' controllers, panels and pendants are computer systems that are designed to communicate with, operate, and/or monitor the Yaskawa Defendants' systems, including the robot arm.

95. The Yaskawa Defendants' controllers, panels and pendants contain modular hardware and an open, PC-based software architecture that is capable of executing a stored program.

96. On information and belief, the Yaskawa Defendants' controllers, panels and pendants contain communication links between the controller, robot arm, and/or pendant and panel that enables communication between the controller and other modules and their associated computational nodes.

97. On information and belief, the Yaskawa Defendants' controllers, pendants, and panel systems contain a graphical user interface that enables a user to manipulate objects related to the articulated robot arm or related to a computational node located on the arm.

98. On information and belief, the Yaskawa Defendants' controllers, pendants, and panel systems provide a plurality of indicators corresponding to the status of the articulated robot arm, a computational node on the arm, or the communication link between the controller, multi-function hub, and/or the arm.

99. On information and belief, the Yaskawa Defendants' controllers facilitate the computational nodes' execution of motion control algorithms by the robot arm, including automatic motion control algorithms.

100. In violation of 35 U.S.C. § 271(b), the Yaskawa Defendants have been and are indirectly infringing the '508 patent by inducing infringement of this patent by others who use the Yaskawa Defendants' Accused Products.

101. The Yaskawa Defendants' affirmative acts of making, selling, and offering to sell its services and/or products, or components thereof, cause the Yaskawa Defendants' Accused Products to be used in a manner that infringes the '508 patent.

102. The Yaskawa Defendants further provide guidance and instruction to third parties to use the Accused Products in their normal and customary way to infringe the '508 patent.

103. The Yaskawa Defendants specifically intend that its customers infringe the '508 patent. The Yaskawa Defendants perform the acts that constitute induced infringement with knowledge of the '508 patent and with knowledge or willful blindness that the induced acts would constitute infringement.

104. In violation of 35 U.S.C. § 271(c), the Yaskawa Defendants have been and are indirectly infringing the '508 patent by contributing to the infringement of this patent by others, such as the Yaskawa Defendants' customers, in the United States.

105. The Yaskawa Defendants offered to sell and have sold in the United States, and imported into the United States, the Accused Products, which are a material part of the invention of the '508 patent. The Yaskawa Defendants know that the Accused Products are especially made or especially adapted for an infringing use, and not a staple article or commodity of commerce suitable for substantial non-infringing use.

106. The Yaskawa Defendants have had actual notice of the '508 patent no later than May 5, 2020, when counsel for Northwestern sent the Yaskawa Defendants a letter identifying the '508 patent and Accused Products that infringe the '508 patent.

107. The Yaskawa Defendants willfully infringe the '508 patent by deliberately engaging in acts of infringement on an ongoing basis with knowledge of the '508 patent.

PRAYER FOR RELIEF

WHEREFORE, Northwestern respectfully requests that this Court:

- a. enter a judgment that the Yaskawa Defendants infringe each of the asserted patents

- b. order an award of damages to Northwestern in an amount adequate to compensate Northwestern for the Yaskawa Defendants' infringement, said damages to be no less than a reasonable royalty;
- c. enter a judgment that the infringement was willful and treble damages under 35 U.S.C § 284;
- d. order an accounting to determine the damages to be awarded to Northwestern as a result of the Yaskawa Defendants' infringement, including an accounting for infringing sales not presented at trial and award additional damages for any such infringing sales;
- e. assess pre-judgment and post-judgment interest and costs against the Yaskawa Defendants, together with an award of such interests and costs, in accordance with 35 U.S.C. § 284;
- f. render a finding that this case is "exceptional" and award to Northwestern its costs, expenses, and reasonable attorneys' fees, as provided by 35 U.S.C. § 285;
- g. grant other and further relief as the Court may deem proper and just.

JURY DEMAND

Pursuant to Federal Rule of Civil Procedure 38, Northwestern respectfully demands a jury trial on all issues and claims so triable.

Dated: February 2, 2021

Respectfully submitted,

NORTHWESTERN UNIVERSITY

By: /s/ Nevin M. Gewertz
Nevin M. Gewertz
Rebecca T. Horwitz
BARTLIT BECK LLP
54 W. Hubbard Street, Suite 300
Chicago, Illinois 60654
Tel.: 312-494-4400
Fax: 312-494-4440
nevin.gewertz@bartlitbeck.com
rebecca.horwitz@bartlitbeck.com

Meg E. Fasulo
BARTLIT BECK LLP
1801 Wewatta Street, Suite 1200
Denver, Colorado 80202
Tel.: 303-592-3100
Fax: 303-592-3140
meg.fasulo@bartlitbeck.com

Counsel for Plaintiff