

X-Ray Machine Visits Patients' Rooms

This portable X-ray machine is equipped with FCR and WiFi.

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In most hospital's, patients have to make their way to radiology to have an X-ray taken. These machines are very powerful and large and in many cases could only take X-rays with the patient standing or lying down. If a patient needed to shift to a position that was not 90 degrees and was in pain, even holding a slight angle could cause discomfort. For emergency patients that need critical care or for patients that are in severe pain, it may be unwise or even impossible to move them without additional risk.

Now a company in Japan, Hitachi Medico, has invented a new version of its portable X-ray machine that can visit the patient. The new X-ray machine is called "Sirius Ubiquitous 2." So, as the name suggests, it is designed to be portable enough to anywhere in a hospital. The machine is equipped with FCR (Fuji Film's registered product), and this system processes X-ray images very quickly and with extreme detail. It's another step towards a full-digital environment in the medical field. For transmitting the X-ray image, the machine has a standard hardwire connection where the X-ray can be downloaded when the machine returns to its base, but as an option, it can be equipped with WiFi so the information can be shared and transmitted in real time.

The machine has a wider monitor than the previous model so visual operation is easier, and the images are larger and more detailed. A new touchscreen was designed with special attention toward the machine operator to give them easier registration, clearer menu selection, and simplified functions. The overall width of the machine was made thinner. This allows it to turn in a much smaller radius than the previous

model so the machine can squeeze into either side of a patient's bed.

The X-ray tube can pivot in both the x and y axis. It is held in place by a telescopic arm. The arm moves in the same direction as its base, which enables more intuitive alignment of the machine with the patient. The arm can be moved with a light push, making positioning easy and intuitive. Since the arm extends both vertically and horizontally, the X-ray can be taken from any position and longer exposure



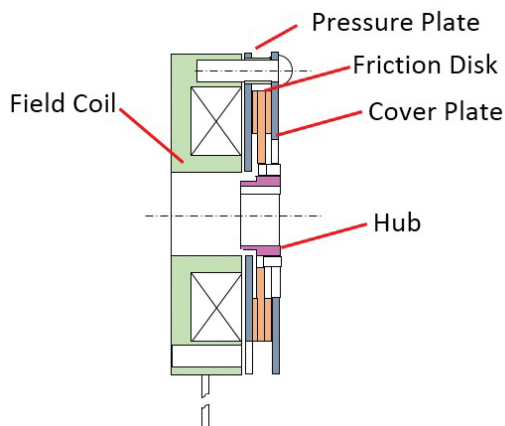
New Portable X-Ray Machine.

distances are possible to obtain higher quality images.

Since the arm can extend further than the previous model, Hitachi realized they needed a brake. Conventional Power-On Electromagnetic Brakes have been utilized in a wide range of motion control applications for decades. The technology and application is well understood in various industries wherever almost any form of linear or rotary motion needs to be dynamically arrested or statically held until released. These devices need the application of power to generate the magnetic field to give the required braking or clutching action.



Ogura Spring-Applied Models.



Cutaway diagram of spring-applied brake.

But for this application the arm was required to be held when no power was applied, so Hitachi knew they needed a power off brake supplier. Hitachi chose Ogura, and their technical team, design suggestions, and production support helped bring the Sirius design from concept to finished product.

The machine operates by being driven to a location in the hospital by two electric motors that power each of the back wheels. Onboard rechargeable batteries help to add weight to counter balance the X-ray arm. Once the machine is in position, the soft, high grip wheels are mechanically locked in place. The arm is aligned to the location, proper patient shielding is applied, the arm is moved to the proper position, and the X-ray tube placement is confirmed. Both Ogura spring-applied brakes lock in place to hold the arm in position and the X-ray is taken.

There are two brakes used in the Hitachi arm. The first brake, Ogura spring applied model RNB3.3G-N, is located on the motor that moves the arm up and down to position the X-ray tube. This brake has to hold the overhung load of the X-ray tube as it can extend over the patient. The second brake, Ogura spring applied model RNB0.4GN, is located at the joint (elbow) that extends the X-ray tube. This joint allows the arm to pull in tight to the machine or to move out over the patient.

The Ogura spring-applied brake, model RNB3.3G-N, (arm base) has a static torque rating of 292-inch lb and the RNB-0.4G-N (elbow) has a torque rating of 35-inch lb. Although the brake torques are different, both brakes operate the same way. When no current/voltage is applied to the brake, a series of springs push against an internal pressure plate, squeezing the friction disc between the inner pressure plate and the outer brake cover place. The friction disc is actually a metal disk with a high coefficient friction material bonded to both sides. This frictional clamping force is transferred to the hub, which is mounted to the shaft of the motor. When the brake is required to release, voltage/current is applied to the coil creating a magnetic field. This magnetic field pulls the pressure plate in against the coil housing, compressing the springs and releasing the clamping force to the friction disc by creating an air

gap that allows the brake, hub, and friction disc to turn freely. The power-off brake is considered engaged when no power is applied, which is why it is considered a safety brake.

The Ogura RNB is designed for holding only. Since it is used for holding only and does not require surface area to dissipate the heat of a stopping brake, the RNB is smaller than an equivalent-sized brake that would be required to stop and hold.

One of Hitachi's design goals was to make the new machine thinner so it could fit into tighter spaces and be more maneuverable. The Ogura RNB series has a very thin profile, which allows for an overall compact package for the X-ray machine. Use of wear-resistant friction material provides extended operational life. Since the brakes are spring set they deliver a fast response time. Sometimes spring set brakes are designed with manual release levers, but for Hitachi's application, the RNB was sized so it can be manually overdriven (pushed) away if needed in an emergency.

Noise is always a concern in a hospital environment. When electromagnetic clutches and brakes engage and disengage there can be a noticeable click. Even a small click can be objectionable in a hospital environment, so Hitachi engineers asked Ogura to come up with a quiet design. Ogura was able to create a design that incorporated a series of dampening rubber grommets that greatly lowered the audible frequency of the click, making the engagement and disengagement extremely quiet.

Frank Flemming is president of Ogura Industrial.



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