



# Intellectual Property Office

## Servo Controlled Impacting Device for Orthopedic Implants

### Technology Reference

R202

### Keywords

Orthopedics  
Medical Device

### Contact

Lauren Rhone  
Technology Transfer  
1725 West Harrison, #439  
Chicago, IL 60612  
P: 312.942.5150  
F: 312.942.2874  
E: Lauren\_rhone@rush.edu

### Inventor

Schwenke et al.

### Field

Orthopedics

### PATENT

US Patent 7,100, 393

This invention relates to a device for controlling the implantation and proper seating of orthopedic implants, and in particular hip implants. Rush is looking for a partner to work with our inventors and develop a novel surgical device for sale into the orthopedic market.

### AREAS OF APPLICATION

Orthopedic Implant Surgery:

- Medical device: Proper seating for total joint implants during surgical procedures

### ADVANTAGES

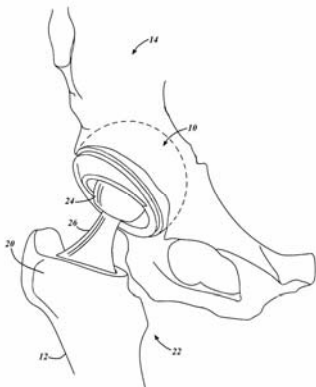
- Provides a quantitative method for determining proper implant seating
- Eliminates guesswork by the surgeon on proper positioning of the implant
- Minimizes the risk of bone fracture during implant insertion
- Reduces revision surgery due to improper press-fit
- Includes a device for monitoring impact on cartilage plugs

### THE TECHNOLOGY

Currently, over 250,000 primary total hip arthroplasties (THA) are performed each year in the United States alone. The number of revision surgeries is also increasing. Constant improvements in implant design, materials, and surgery techniques help the patient regain a normal lifestyle sooner as well as a more promising outlook on long-term success. One recent technological breakthrough in THA is the Minimal Invasive Surgery (MIS) technique for artificial hip joints, which cuts down hospitalization time significantly. With MIS, patients may start ambulating within 24 hours after surgery.

One important goal of THA is to ensure sufficient primary stability, guarantee bone ingrowths, and achieve long-term success. Good primary stability can be reached through tight press-fit relationship of the implant-bone interface. Conventionally, a tight press-fit relationship requires the right tools along with surgeon's experience. As such, proper training and continuous technical improvement help to meet the increasing demand of fully functioning hip replacements.

Total hip displacement surgeries generally consist of different phases from pre-operative measurements to exposing the proximal femur and performing the osteotomy of the femoral neck. After opening the femoral canal and rasping to the appropriate size, a trial and then the final implant are inserted into the proximal femur. The femoral stem of the final implant is pressed down the femoral canal by hand until it stops, usually 2 to 3 cm above the neck osteotomy. The implant is then tapped with an impactor until its final position is reached, and



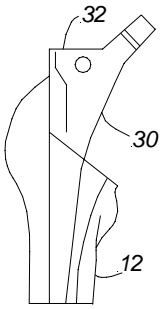


FIG. 2

ideally the implant stops advancing. The right amount of tapping force has to be applied to gain a good press-fit situation of the implant, while the insertion resistance of the implant may increase as the stem is advanced down the canal.

Obtaining the optimal press-fit under the given conditions and, thus, good primary stability often depends on the surgeon's experience. Implant size, rasping technique, bone constitution, and tapping strength are leading factors influencing the outcome of the hip arthroplasty.

If the femoral stem is inserted outside an ideal press-fit bandwidth, it is either too loose and therefore, lacks primary stability, or too tight, leading to bone resorption and, in extreme cases, fracture of the femur. Advanced surgery techniques, such as MIS, are subject to constraints like limited access to the femoral neck and reduced acoustical feedback, which increase the risk for effects of sub-ideal implant insertion. Sub-optimal primary stability and fracture of the femur may necessitate bigger incisions and thus contradict the advantages of MIS. New tools need to be developed to overcome these and other limitations of conventional orthopedic implants and to guarantee continuous high quality THA's.

Our invention provides a method and device to improve the optimal press-fit. Our researchers are interested in working with a licensee to continue the development of the technique, to move the concept from the laboratory to the clinic and to expand its utility to other joint replacement techniques.

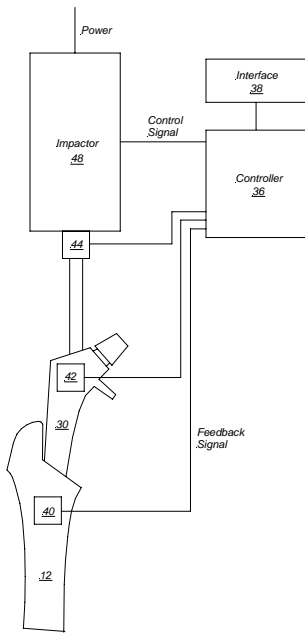


FIG. 3

Rush Medical Center University  
[www.rush.edu/research](http://www.rush.edu/research)  
 Intellectual Property Office