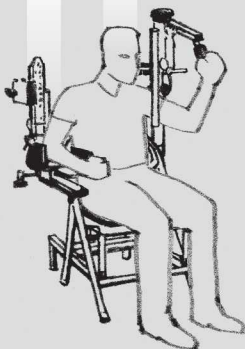
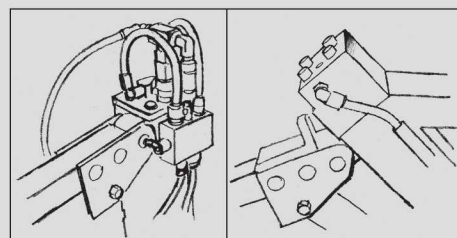


*Humphrey*



Humphrey's custom valve assembly enabled customer to provide more reliable and consistent pressure control in their resistance equipment used for physical rehabilitation.



Existing valve assembly had multiple fittings creating many leak points.

Humphrey's custom design with integral circuits eliminated leak points to ensure more consistent performance.

## Custom Valve Reduced Leakage and Provided More Consistent Performance of Physical Rehabilitation Equipment

### THE CUSTOMER'S PRODUCT:

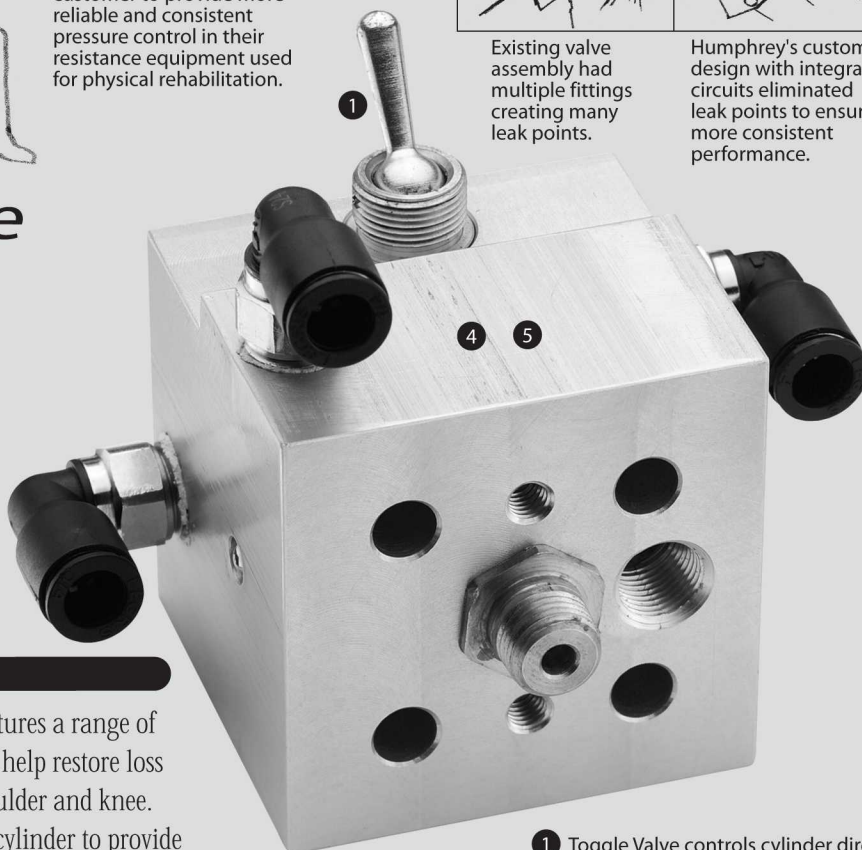
- The customer designs and manufactures a range of physical therapy equipment used to help restore loss of mobility in the ankle, elbow, shoulder and knee.
- The equipment utilizes a pressured cylinder to provide the prescribed resistance for repetitive motion therapy.
- Being in a clinical environment, the equipment had to utilize a non-toxic fluid -- baby oil -- instead of the traditional hydraulic fluid.

### THE REQUIREMENTS:

- Design a valve assembly that would eliminate leakage, enabling the therapist to set and maintain the prescribed amount of resistance applied to the patient's extremity.
- Provide a larger internal check valve with greater flow to enable the hand pump to be stroked only once, supplying the cylinder with the needed pressure.
- Create a standardized assembly that would function with the many different types of equipment the customer supplies.

### THE HUMPHREY ENGINEERED SOLUTION:

- Modified the Humphrey 41V valve to increase seal compression around the toggle to prevent oil leakage.
- Created integrated circuits to eliminate external fittings and tubing that were the source of leak points that had resulted in pressure variations.
- Made entire assembly compatible with baby oil medium.
- Incorporated two check valves to provide single-stroke supply pressure to "charge" the system.



- 1 Toggle Valve controls cylinder direction -- extend/retract
- 2 Actuator controls amount of resistance (not shown)
- 3 Integral check valves to hold pressure (not shown)
- 4 Integral circuitry reduced leak points
- 5 Functions as a hydraulic valve with baby oil as the medium

SIC: 3841



**HEALTHCARE  
REHABILITATION**

## THE SOLUTION:

The Engineered Solutions approach started with a Humphrey engineer working directly with the customer's engineering department to identify all the requirements and opportunities to improve the product. In this case, the customer wanted to minimize internal and external leakage of baby oil used to pressurize the system.

Humphrey created an integrated design with all circuitry inside the assembly, twin check valves and a modified Humphrey 41V toggle valve that controlled the direction of the cylinder. This new design provides resistance in both modes -- extension and retraction -- while eliminating fluid leakage and pressure loss.

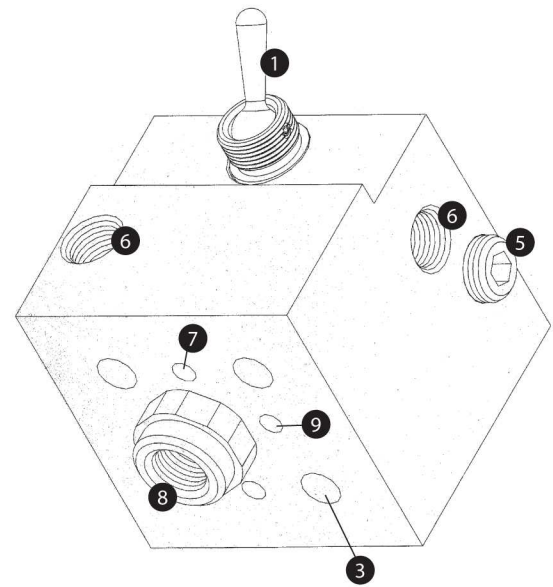
## THE PROCESS:

Responding to the customer's concerns about leakage the Humphrey Engineered Solutions team evaluated the existing system, which consisted of a valve manifold with external fittings and tubing, a hand pump and a cylinder. The cylinder was connected to the apparatus that provided the extension and retraction therapy.

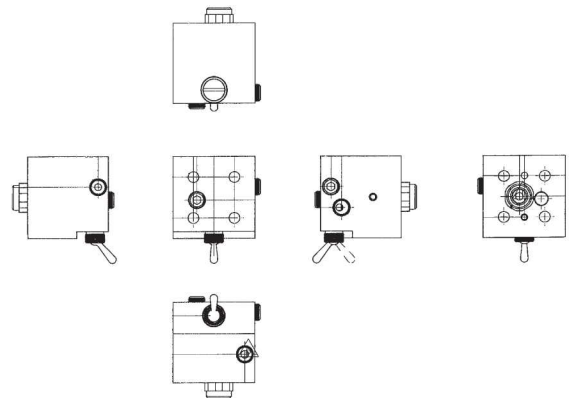
The external leakage of baby oil from numerous fittings and hoses produced an unsightly condition in the clinical environment. Internal leakage was an even greater problem for the therapist since a specific amount of resistance offered by the equipment had to be maintained for each patient.

Humphrey engineers developed a manifold with integral components and fluid passages to eliminate the potential for external leakage and modified the 41V toggle valve. Humphrey then added twin check valves to allow the system to be charge with a single stroke of the hand pump. Finally, numerous orifices were provided, together with plugs, to enable the customer to utilize a single valve module for a number of different pieces of equipment.

The resulting Engineered Solution met the customer's performance expectations, and went beyond -- the entire package was smaller, the elimination of the unsightly external fittings and tubing resulted in significantly more professional looking equipment, and now the customer has one standard manifold instead of having to inventory and assemble different components for each type of equipment.



- 1 1/8-27 NPSF N/C with toggle as shown
- 2 41V Valve and Two Check Valves built into manifold
- 3 Four Thru Mounting Holes
- 4 Fill Port
- 5 1/8-27 NPSF with Pipe Plug N/C with toggle as shown
- 6 1/8-27 NPSF N/C with toggle as shown
- 7 Exhaust Ports
- 8 From Reservoir to Check Valve
- 9 Pump Port



**Humphrey**<sup>®</sup>  
Build On Our Experience