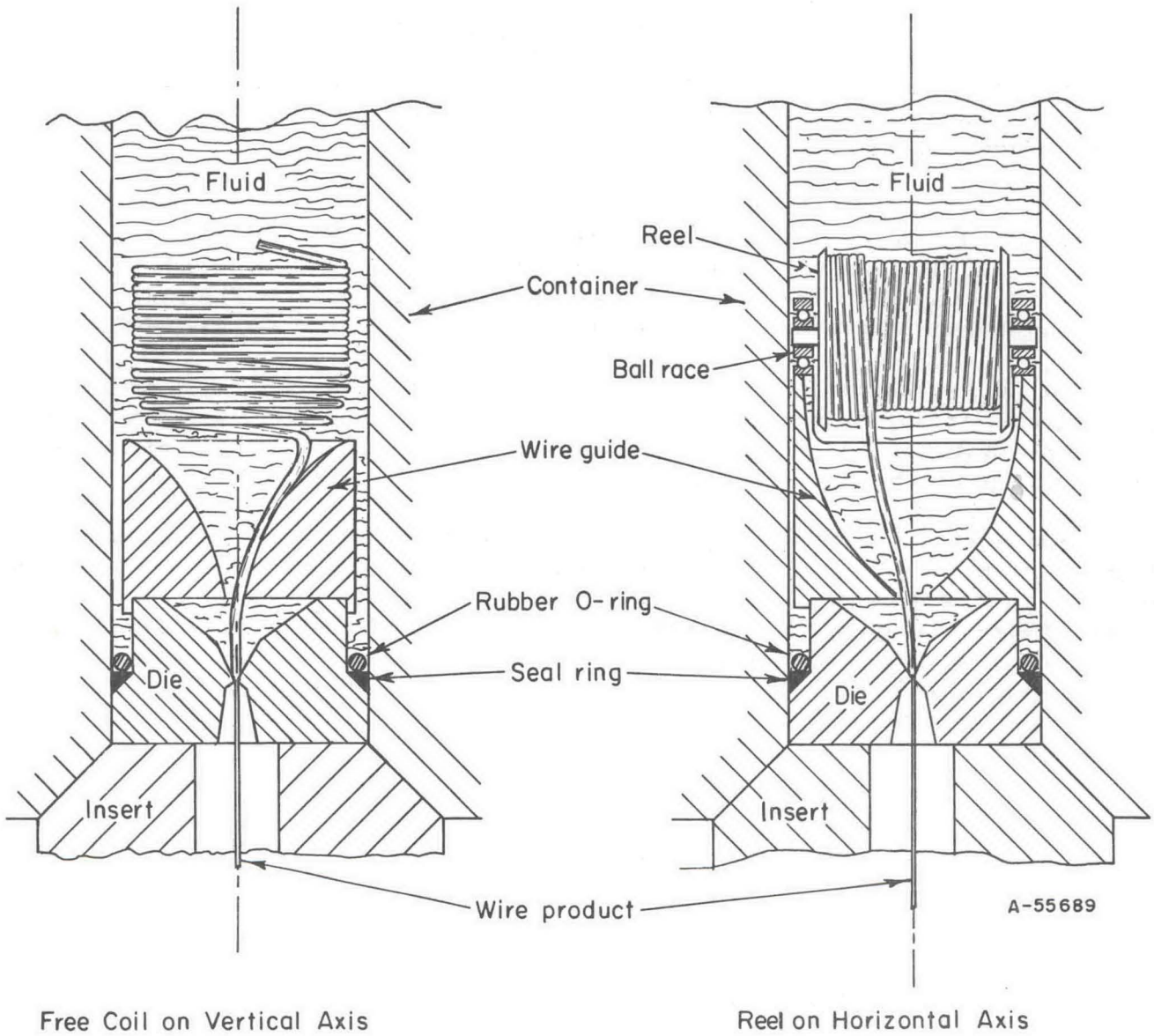

FIGURE 36. TWO METHODS OF UNREELING WIRE FROM WITHIN A SMALL-BORE CONTAINER

conventional wire-drawing techniques or by chemical etching. In the case of shapes, the point may be machined from the billet to be reduced by HYDRAW or a piece of similar material, suitable for attachment to the cable can be butt-welded to the billet.

Operational Sequence

At the start of a typical run, the die and the wire coil or billet would be seated in position on the insert. The container is lowered and seated on the insert with a hold-down force to assist in axial alignment of the container with the stem. The reduced section of the wire or billet is then connected to the take-up reel. A drawing load of about 80 percent of its breaking load is applied after the fluid is added to the container and the stem is lowered into the container ready to pressurize the fluid.

As the stem is forced against the fluid, the resulting fluid pressure rise is monitored on an X-Y recorder. When extrusion-drawing commences, the fluid pressure is held constant at the level (P). Like the hydrostatic extrusion of solid rounds when lubrication is not perfect, a breakthrough pressure peak is experienced. The runout draw stress on the draw stress/time chart is lower than the initial draw-stress setting.

The fluid pressure (P) + runout draw stress (D) requirement to cause extrusion is virtually constant for a given set of extrusion conditions. The value P + D is used in extrusion-drawing or HYDRAW for evaluation and comparison purposes in much the same way as fluid pressure is used in the hydrostatic extrusion of solid rounds.

During HYDRAW, the fluid pressure will gradually drop due to the volume of wire displaced from the container. For fine wire this is largely compensated for by the availability of an excess in draw-stress up to the set limit. If, as in the case of large-diameter wire or shapes, draw-stress compensation is inadequate to maintain the P + D value to cause extrusion drawing, then fluid pressure is increased. During a run, drawing speed may be occasionally varied to investigate the effect of exit speed on pressures and product quality. Intentional stopping of extrusion-drawing could be achieved by:

(1) Reducing the drawing stress when a known quantity of wire or shape was produced.

(2) Reducing the fluid pressure.

HYDRAW of Ti-6Al-4V Titanium Alloy Wire

HYDRAW trials were conducted with Ti-6Al-4V wire at reduction ratios of 1.35, 2, and 4:1 with the aim of determining the P + D requirements for this alloy. Data for these trials are given in Table XXXII. The wire was anodized with the C3 coating and was pointed by a combination of wire drawing and chemical etching.

Wire of good quality was produced at reductions in area of 1.35 and 2:1 at drawing speeds of 34 fpm. At the higher ratio of 4:1, however, breakthrough was not achieved. The data obtained at the two lower ratios indicate that the P + D requirements for the