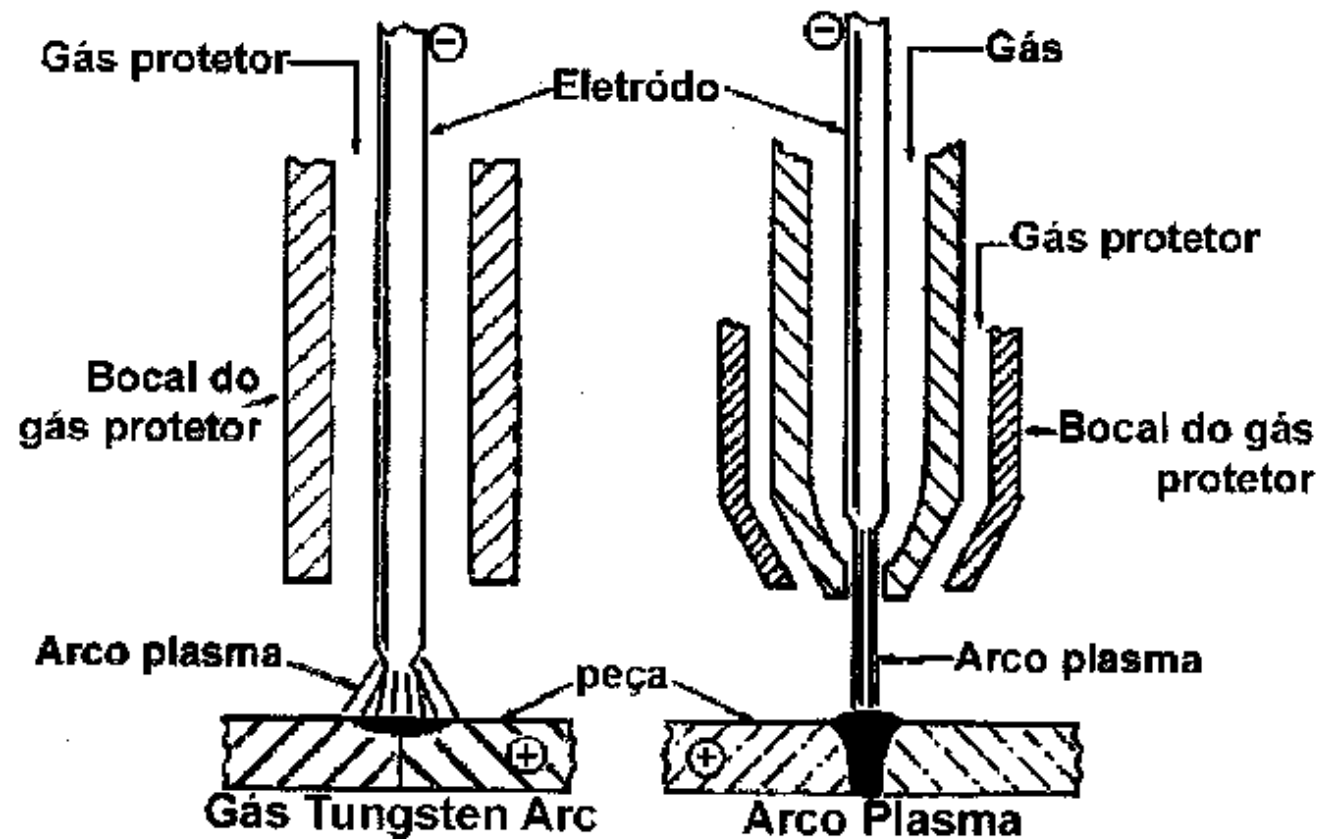
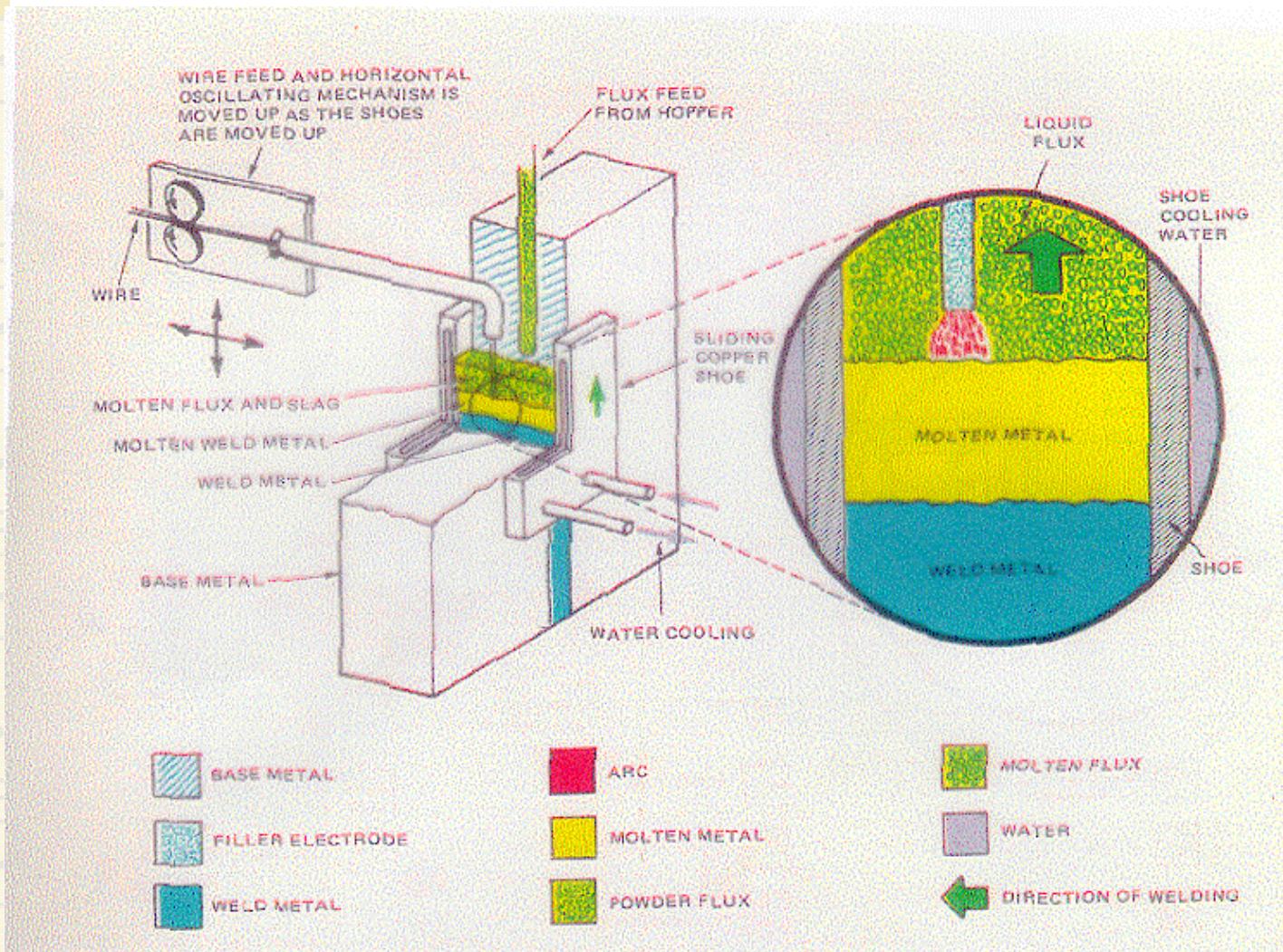


Comparação SATG e SAP

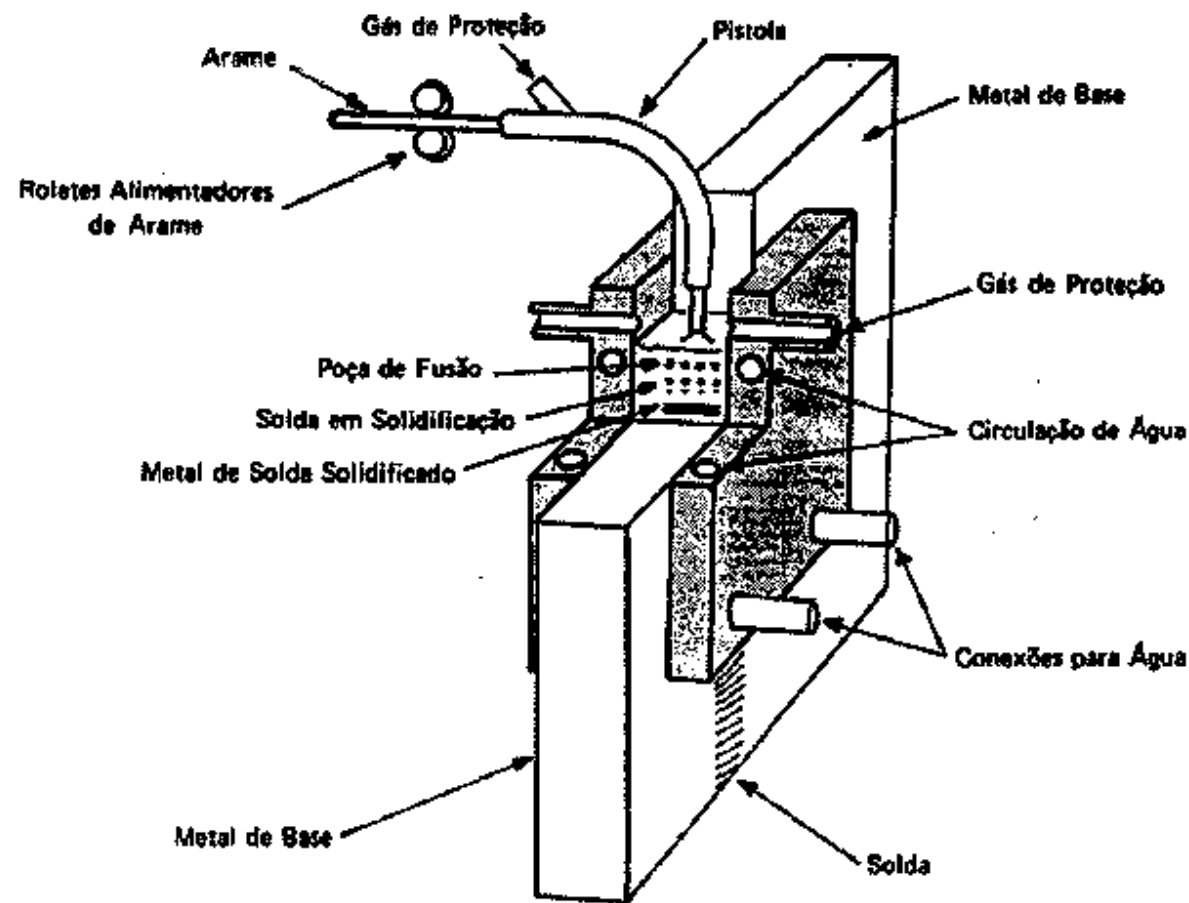


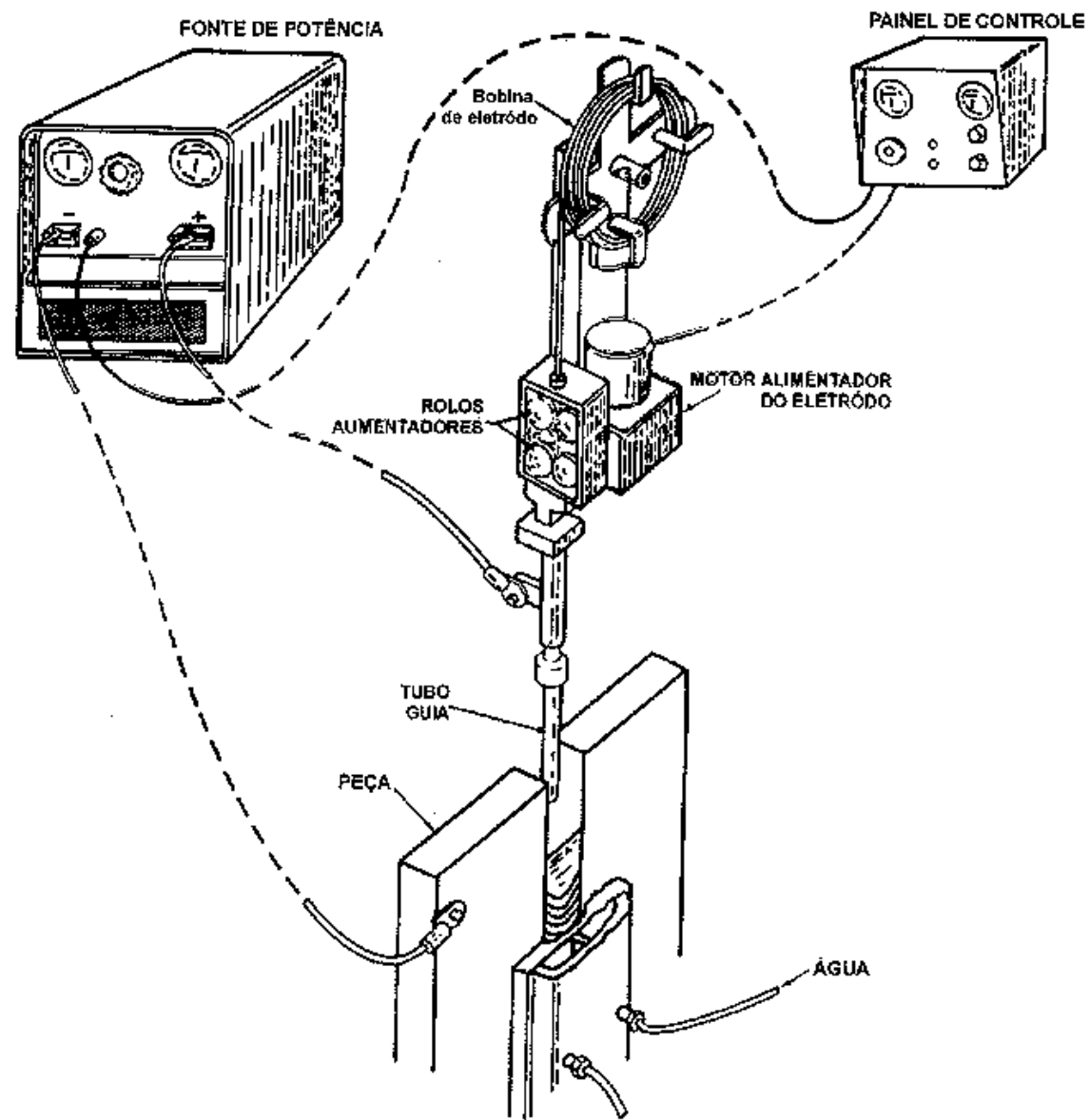
COMPARAÇÃO ENTRE OS PROCESSOS SATG E SAP

● Soldagem a Eletroescória e Eletrogás



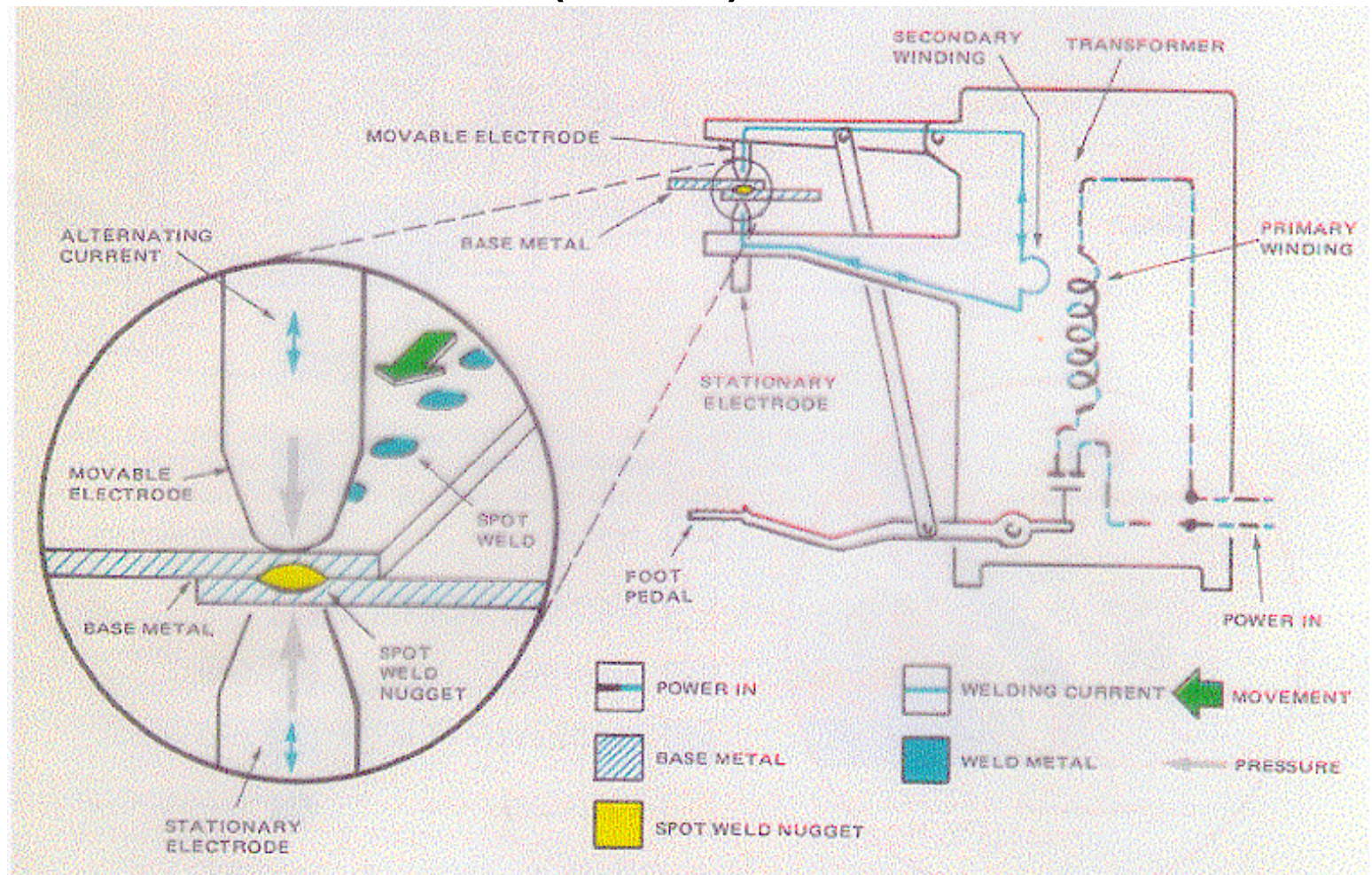
Soldagem por Eletroescória ou por Eletrogás (SEE ou SEG)



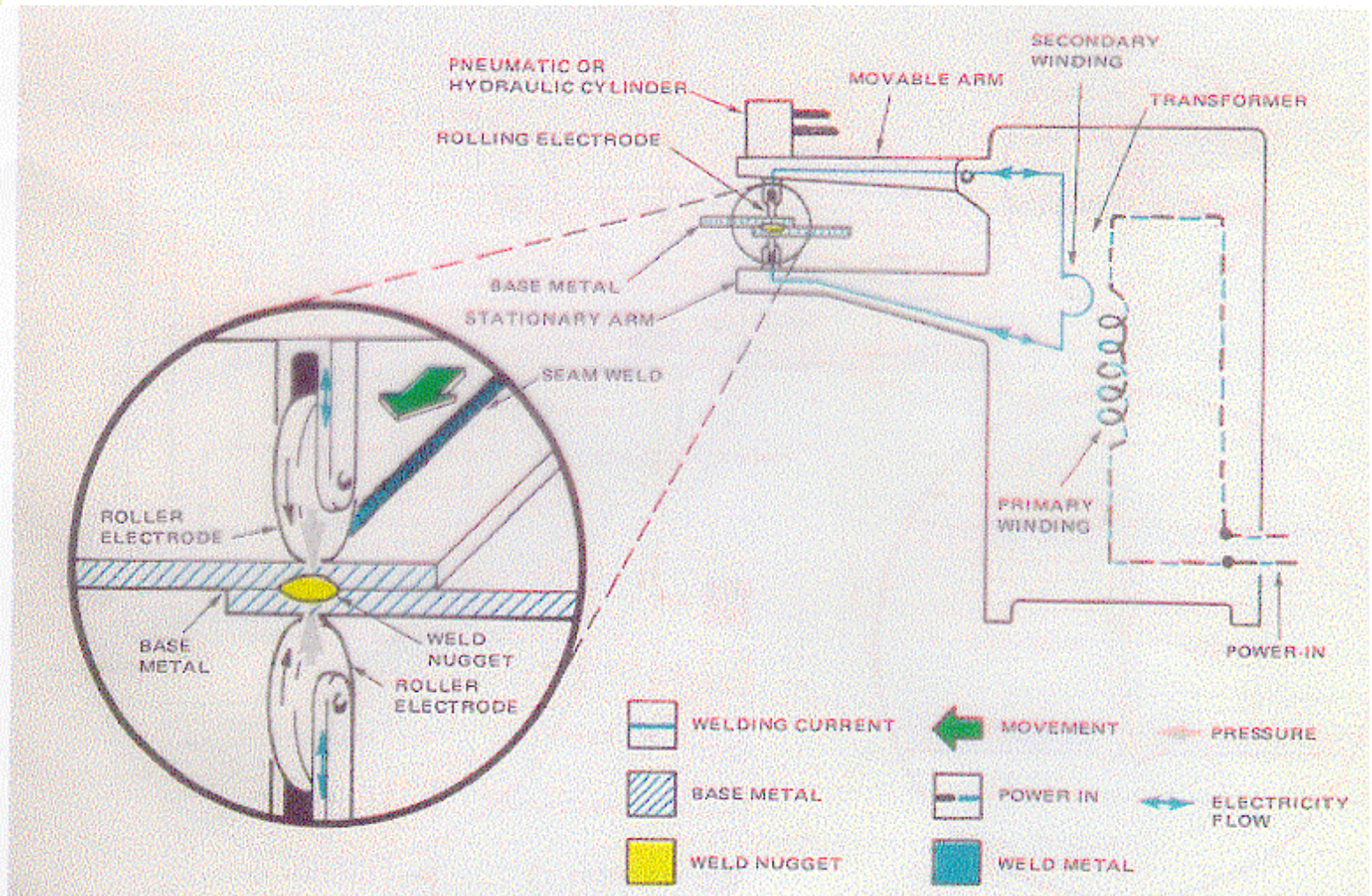


EQUIPAMENTO PARA SOLDAGEM SEG

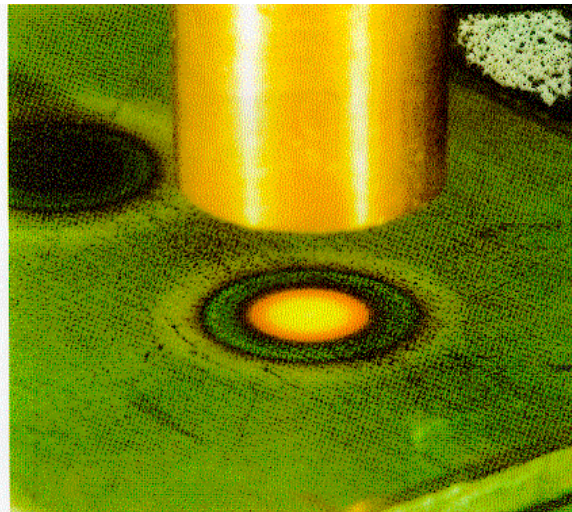
● Soldagem por Resistência por Ponto (SRP)



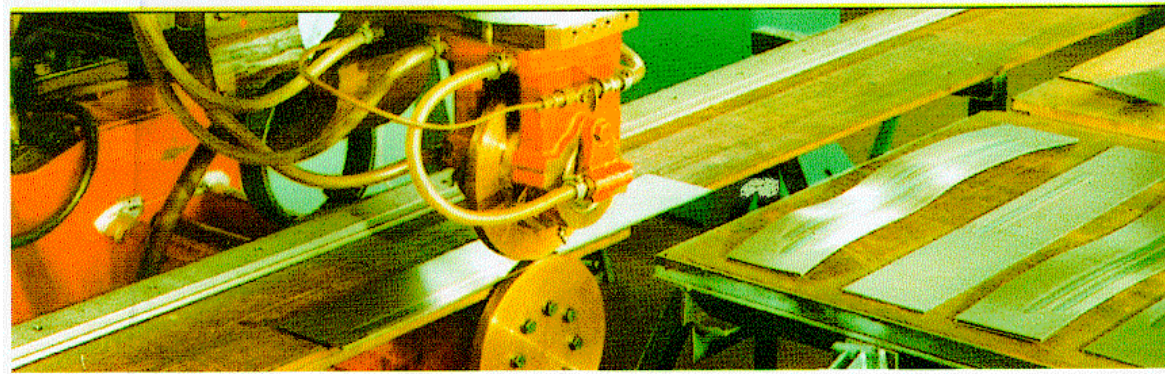
Soldagem por Resistência por Costura (SRC)



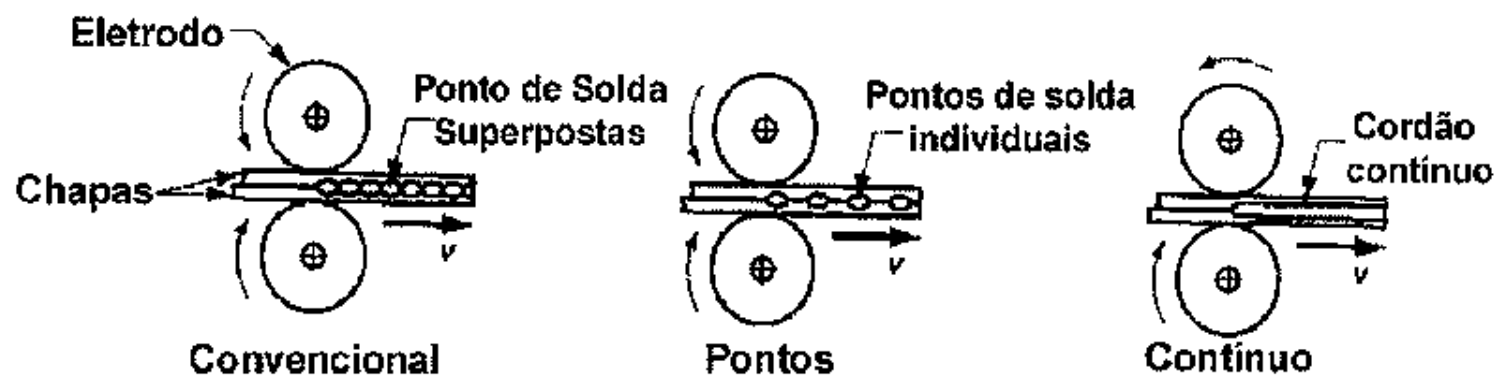
SRP e SRC



Soldagem por ponto
logo após o
levantamento do
eletrodo

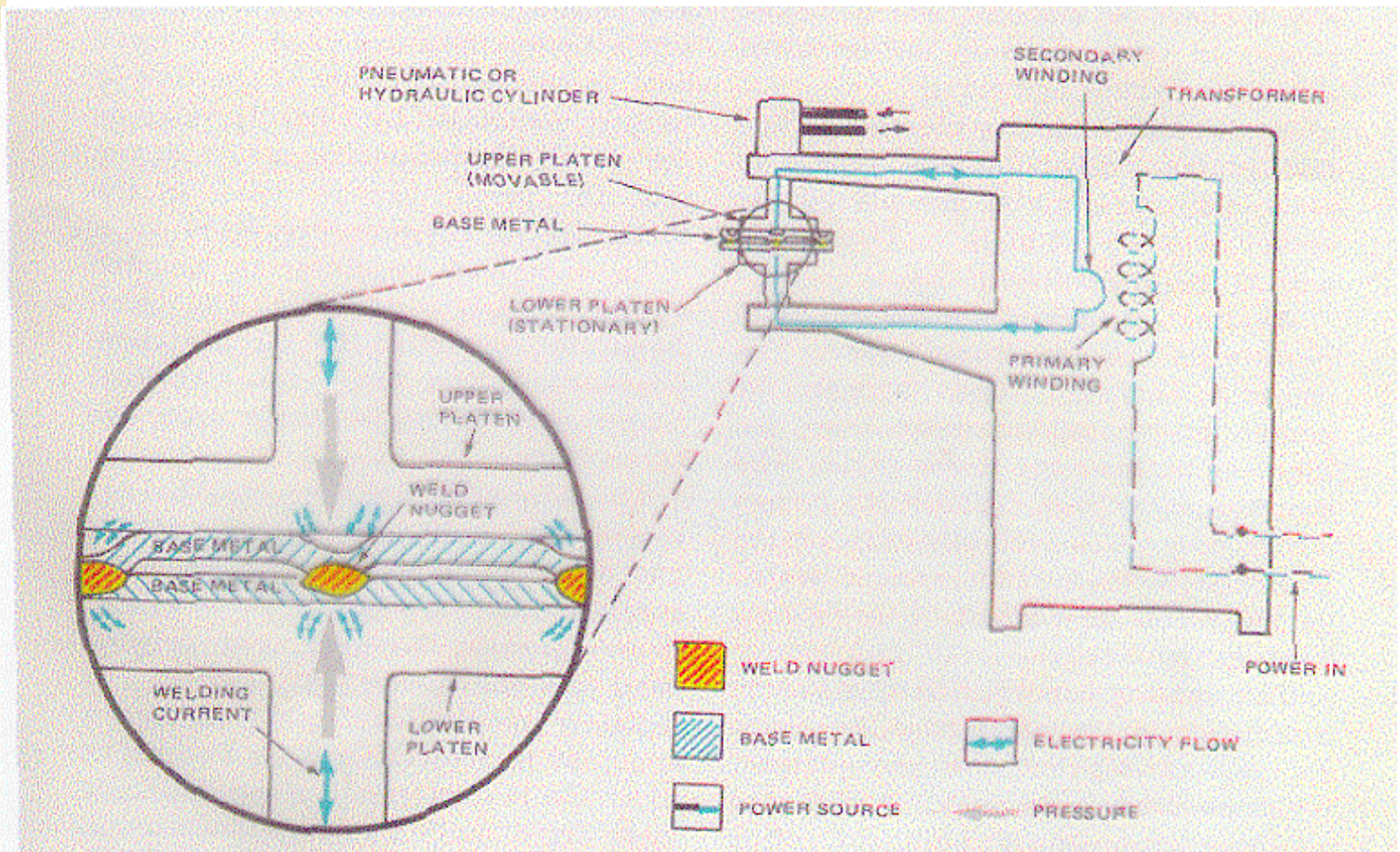


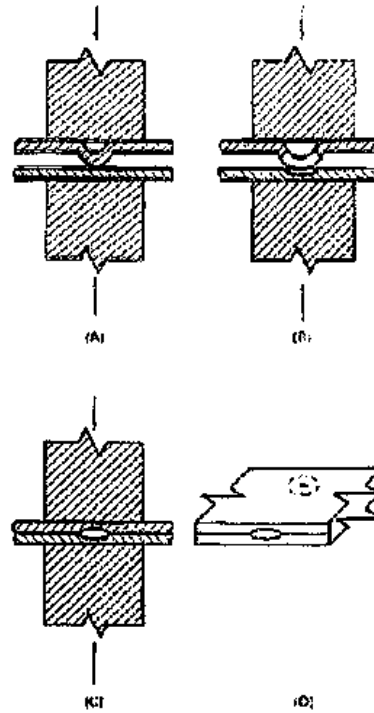
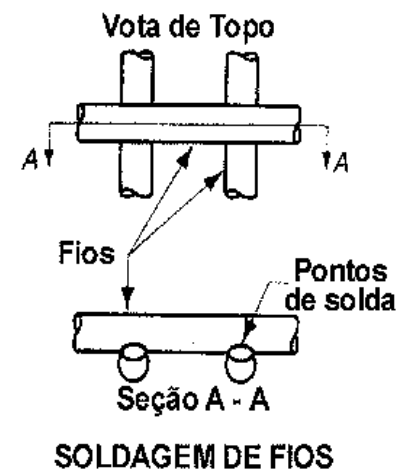
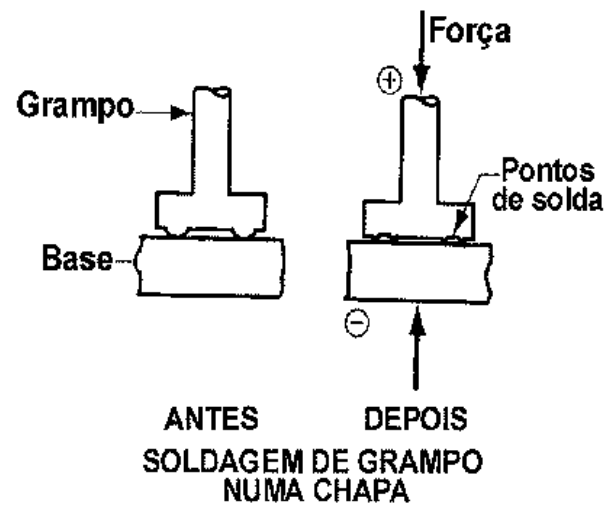
Tipos de cordão



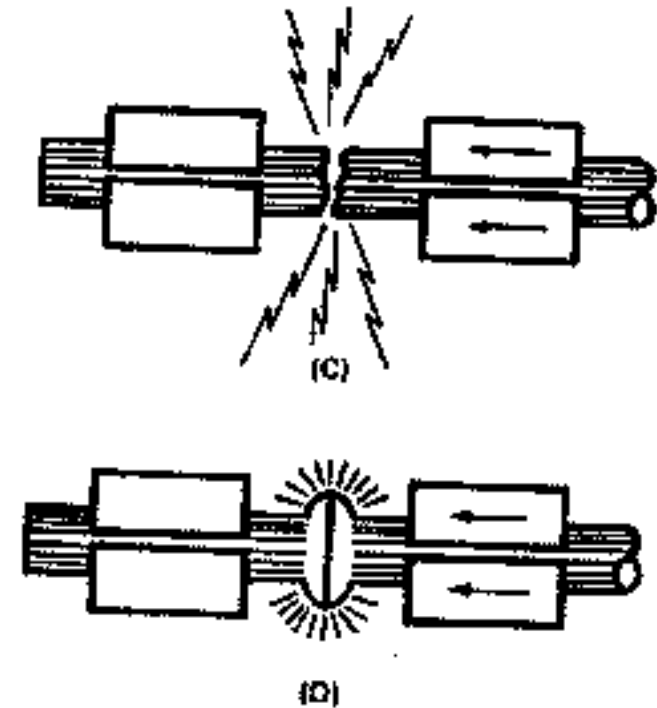
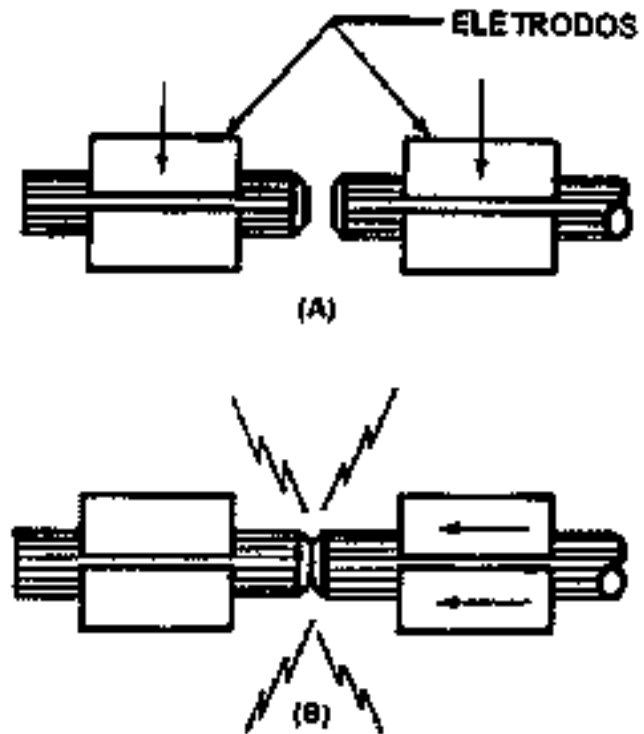
TIPOS DE CORDÕES DE SOLDA

Soldagem por Resistência por Projeção (SRPR)

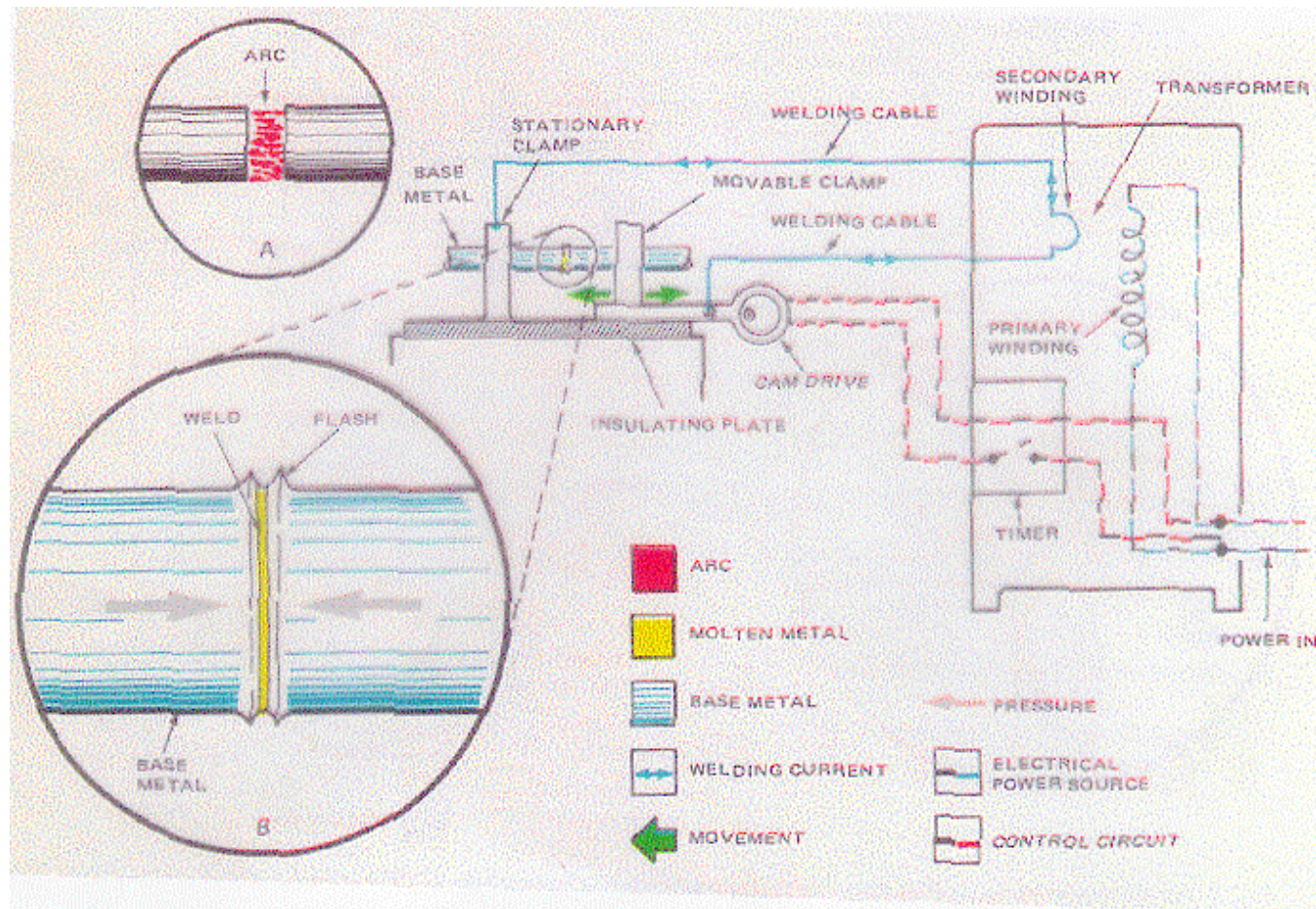




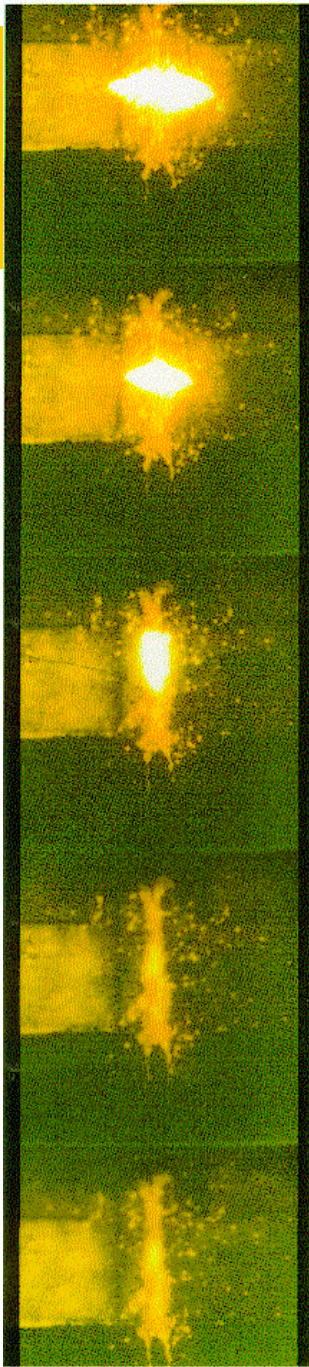
Soldagem ao Arco por Centelhamento (SAC)

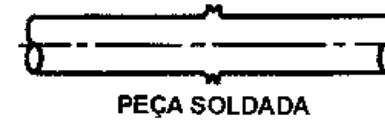
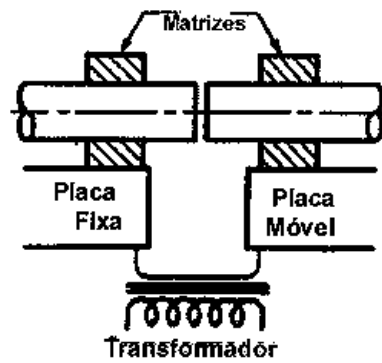


Soldagem ao Arco por Centelhamento

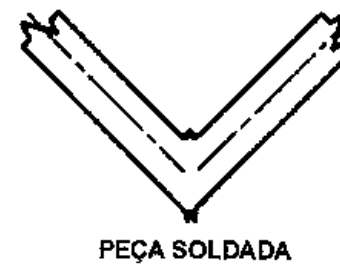
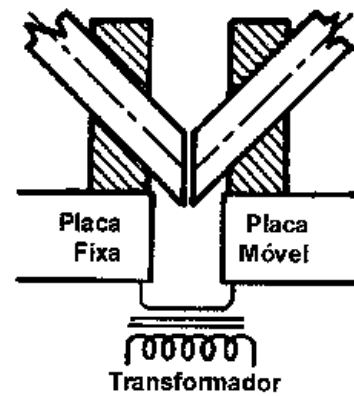


Processo de Soldagem a Arco por Centelhamento (SAC)

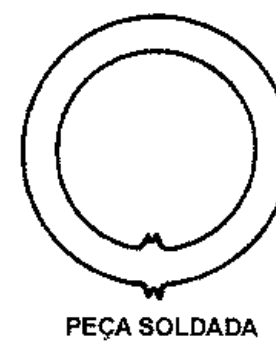
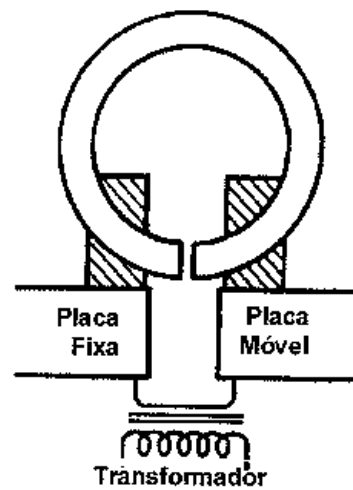




(A) SOLDAGEM ALINHADA

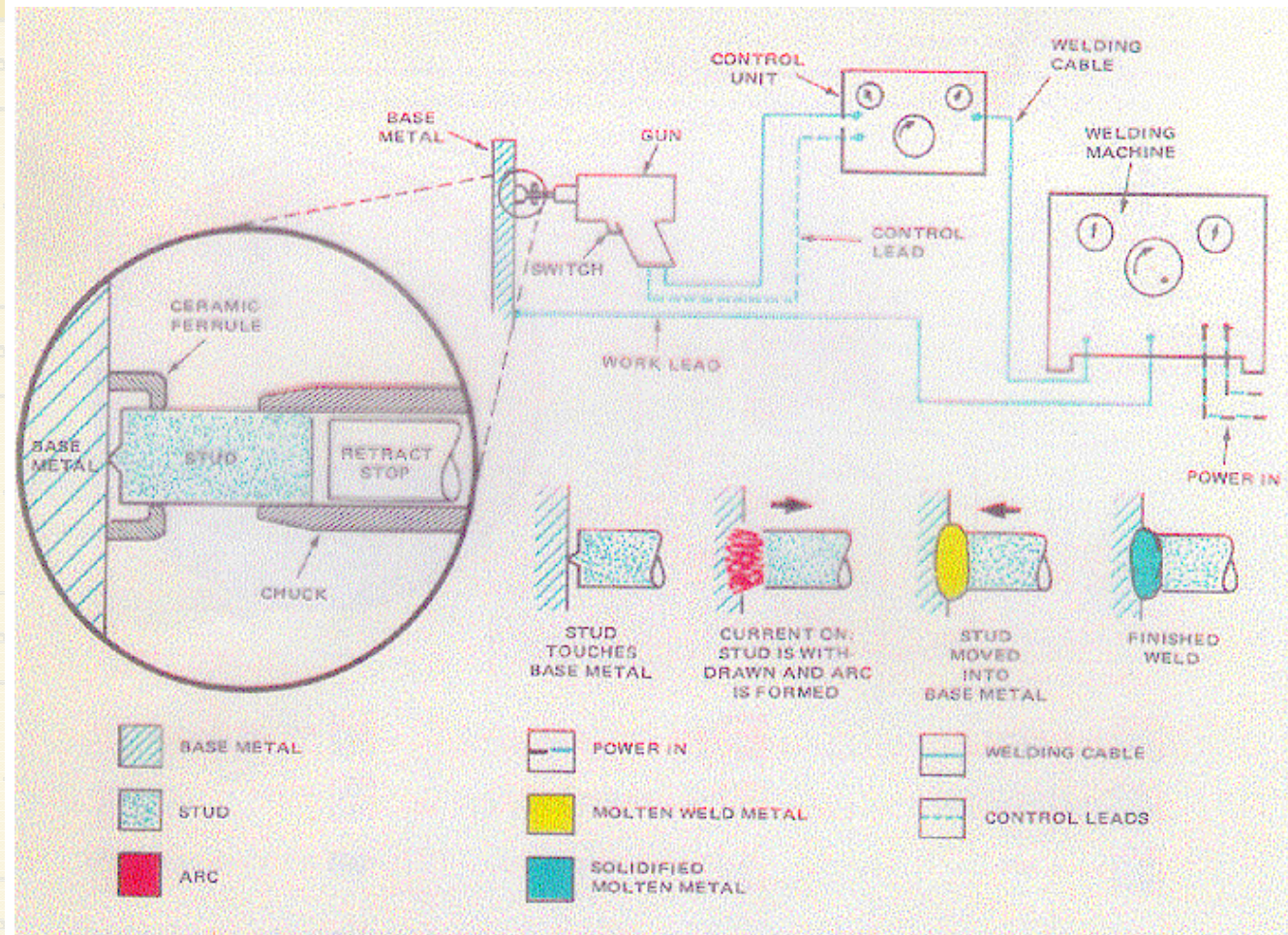


(B) SOLDAGEM DE ESQUADRIA



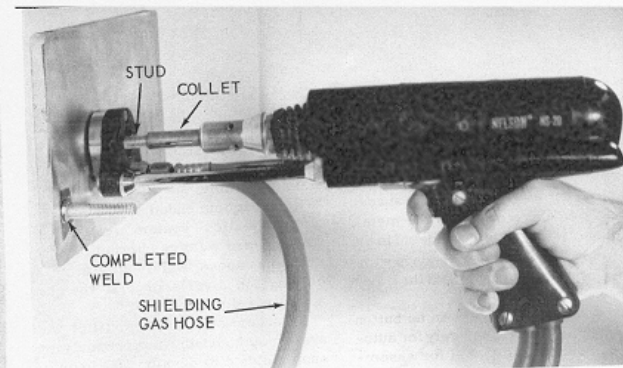
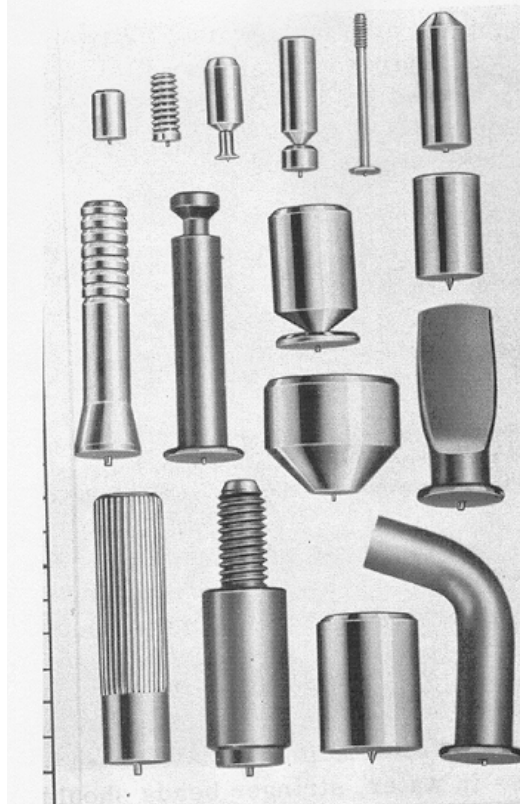
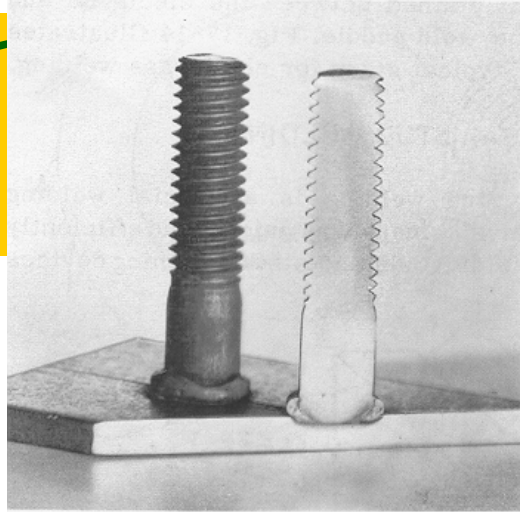
(C) SOLDAGEM DE ANEL

Soldagem de Pinos (SP)

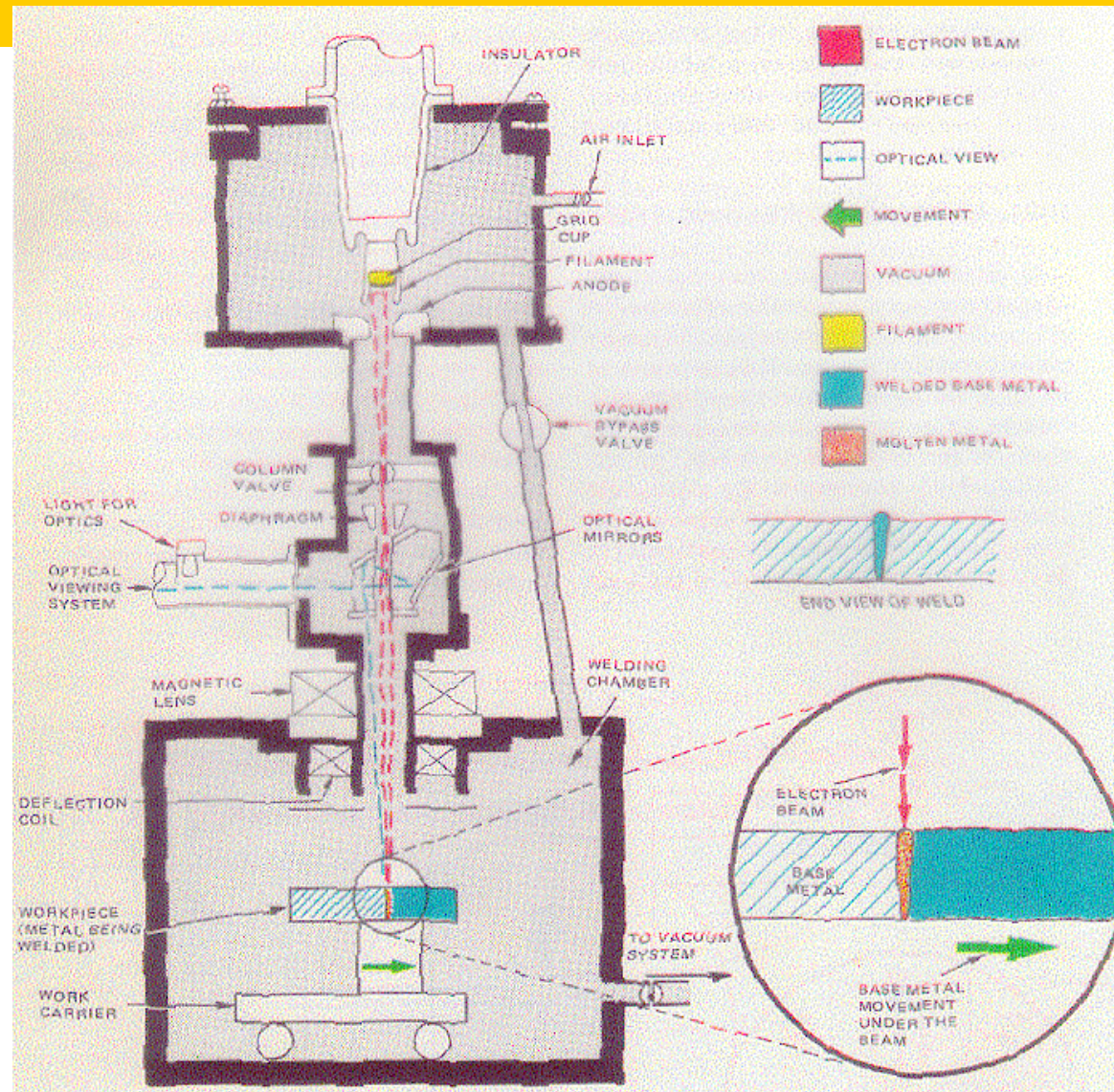


Processo de Soldagem de Pinos (SP)

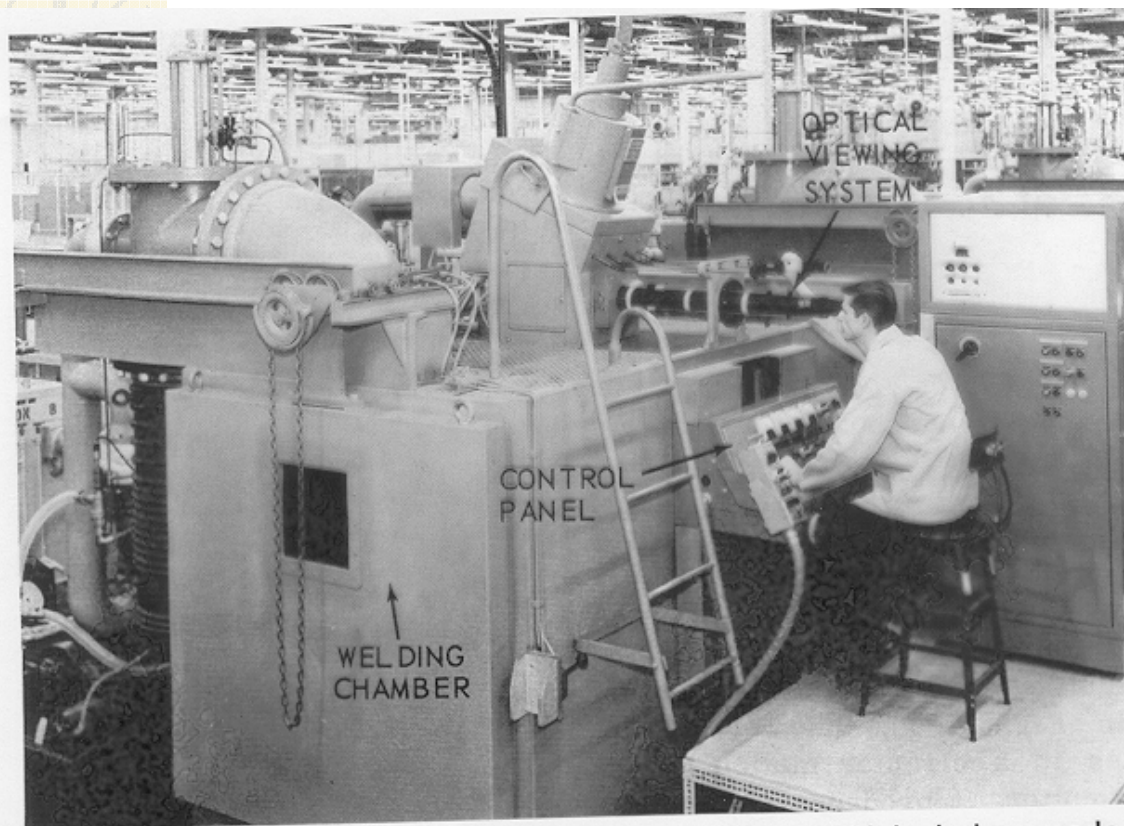
SOLDAGEM DE PINOS



Soldagem por Feixe de Elétrons (SFE)



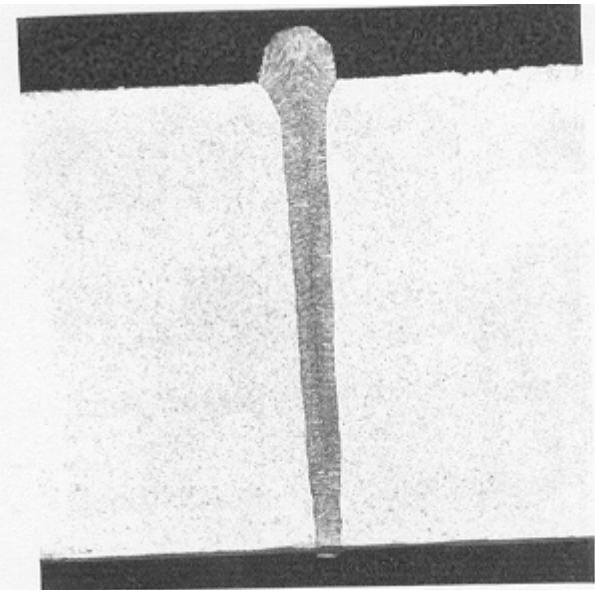
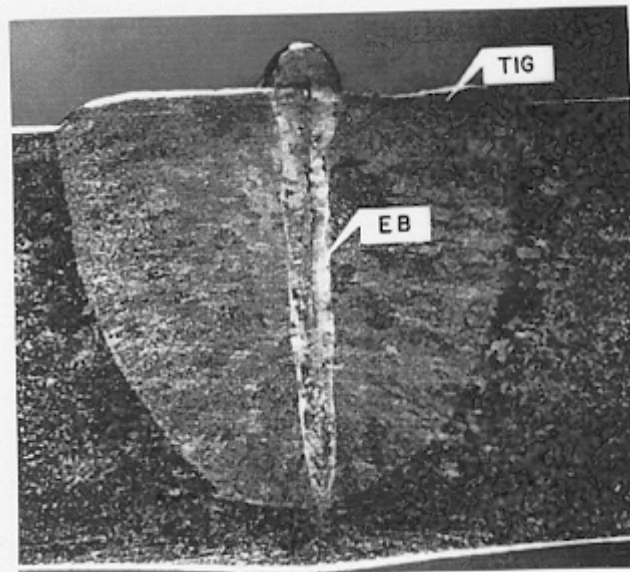
Soldagem por Feixe de Elétrons



Complete electron beam welding machine. The weld is being made within an enclosed chamber. The operator views the weld through a special optical system. (Hamilton Standard Div., United Aircraft Corp.)

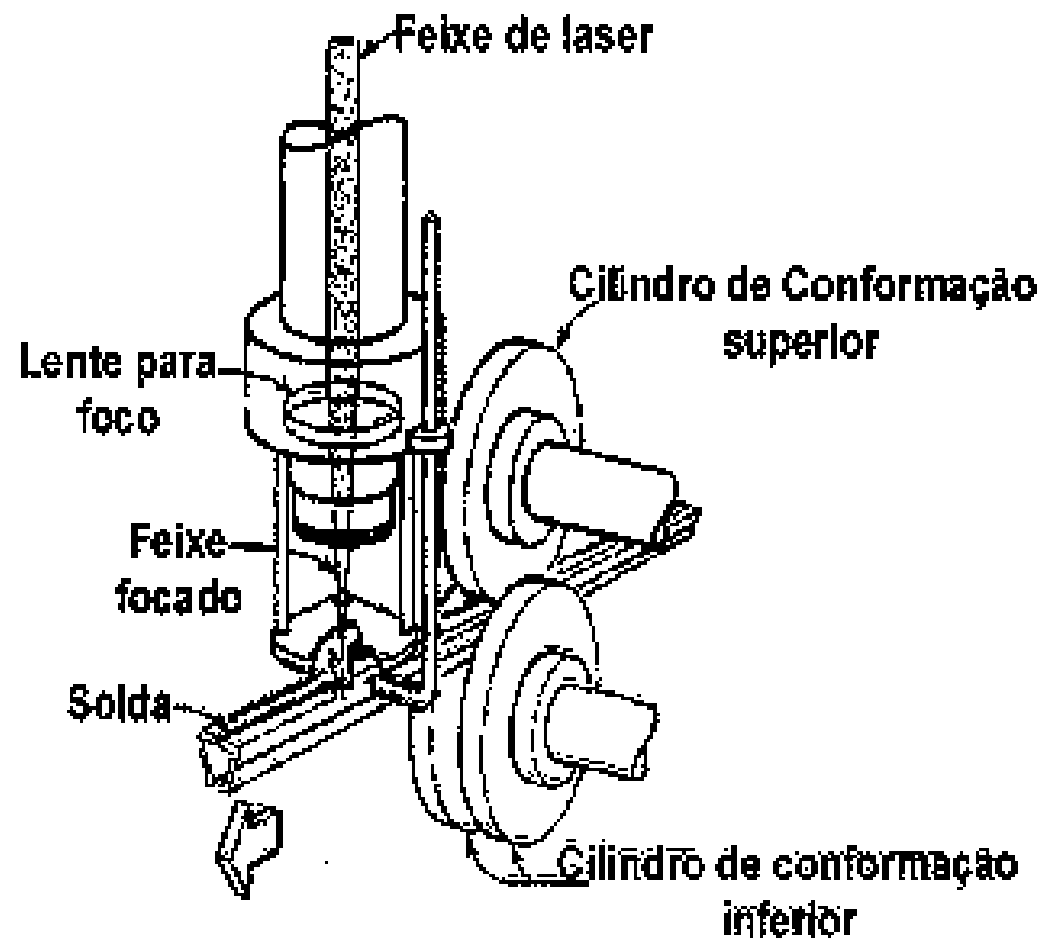
Filme

Soldagem por Feixe de Elétrons

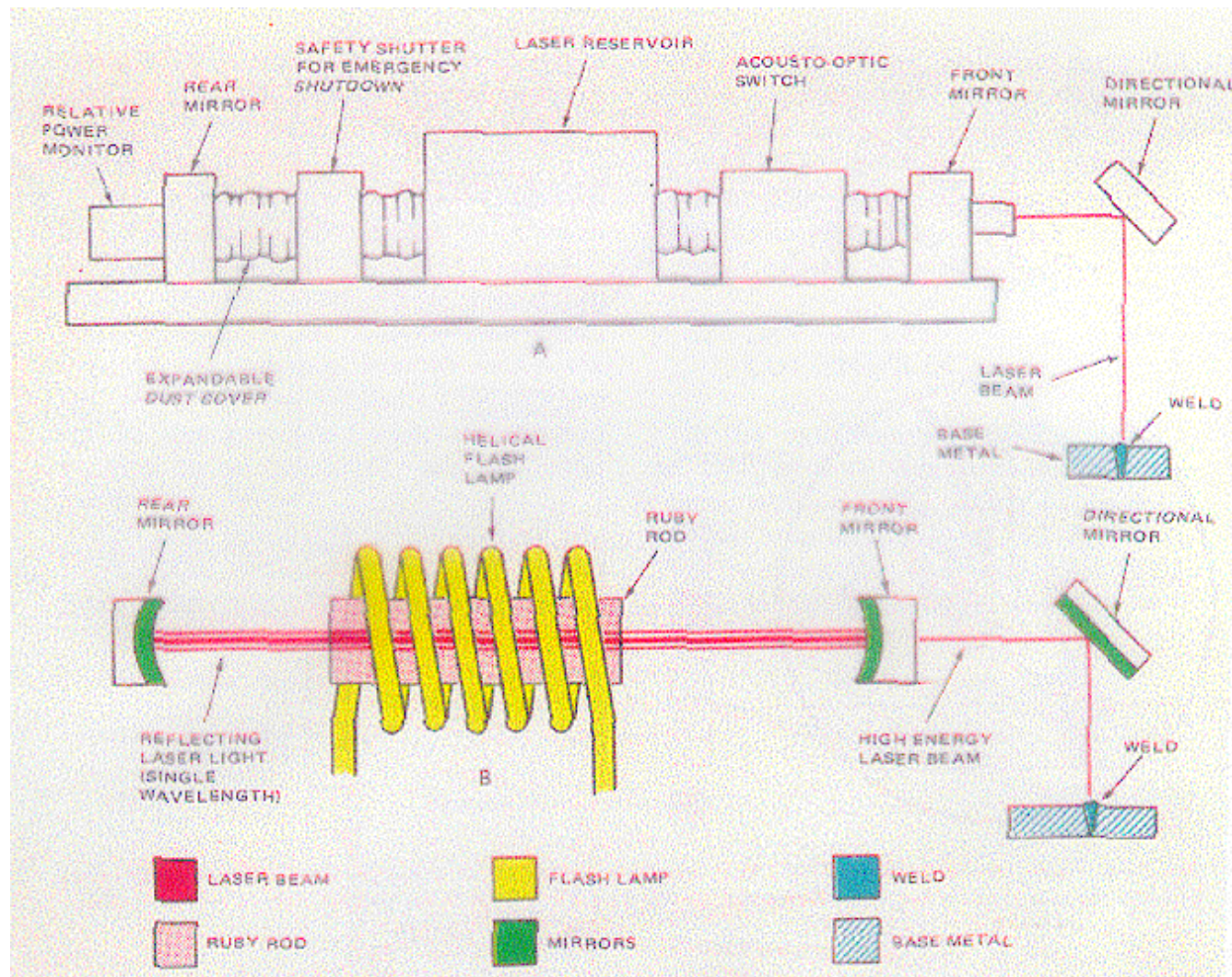


Material: aço

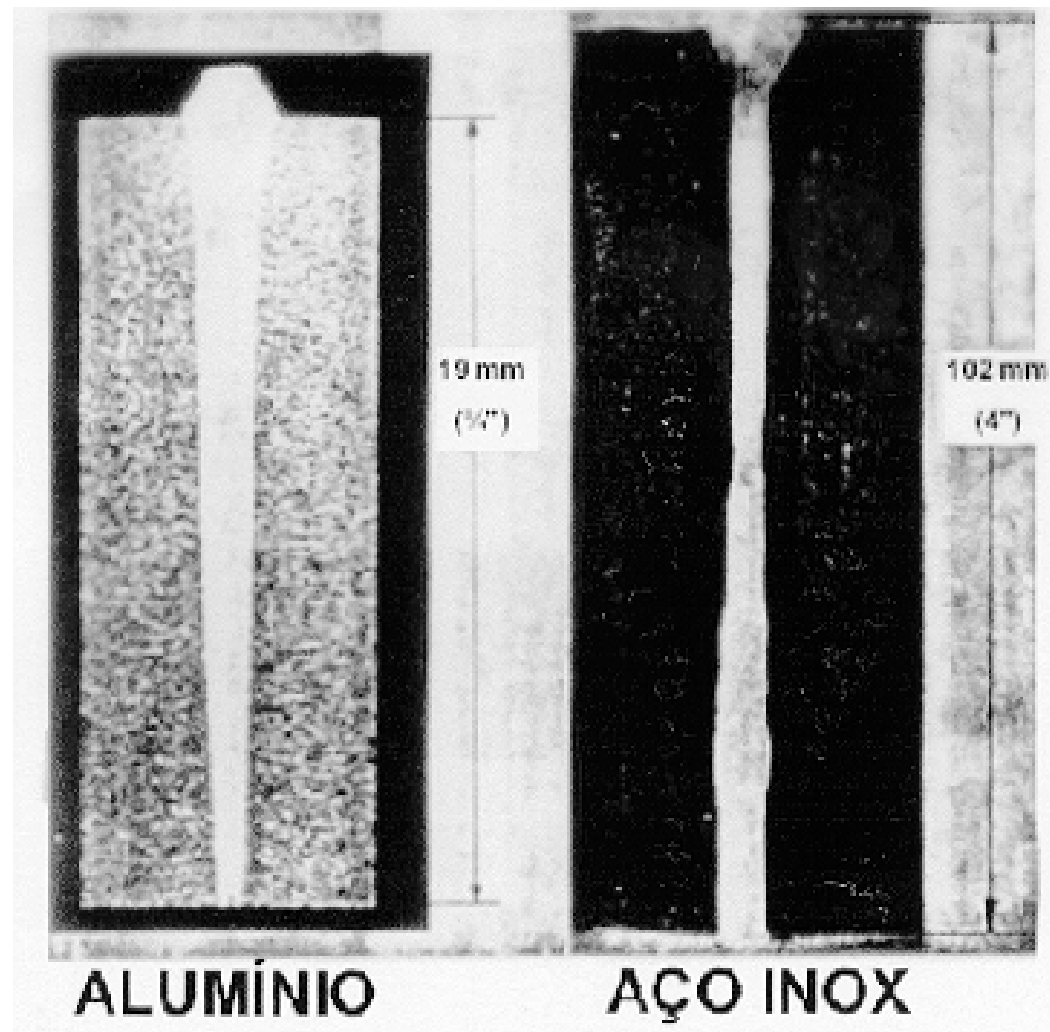
Soldagem por LASER (SL)



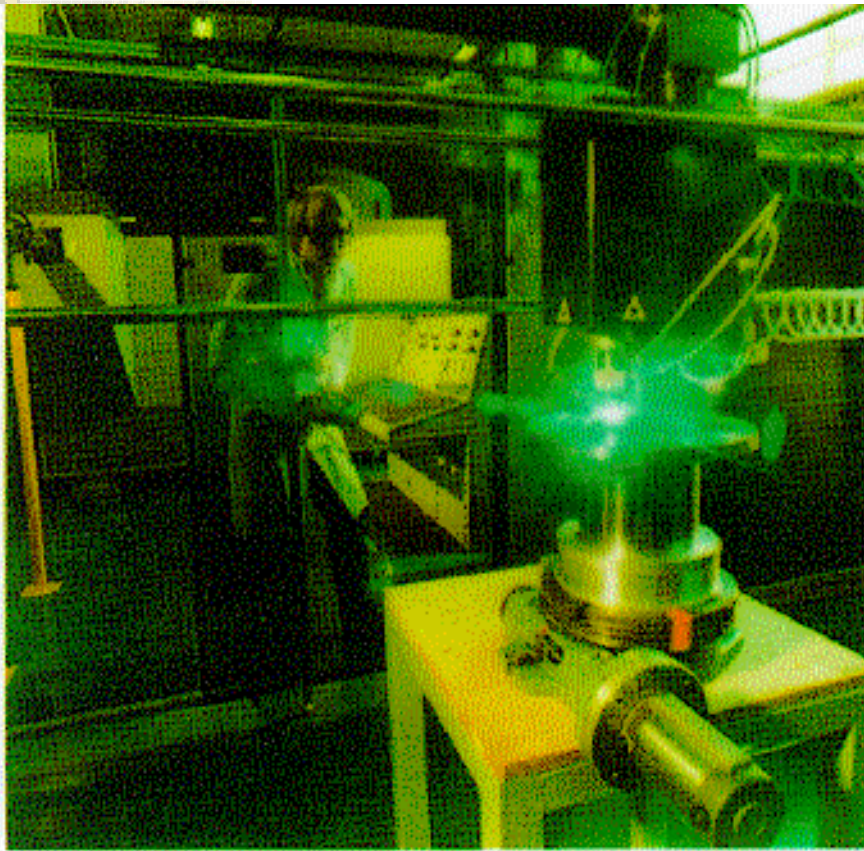
Fontes de LASER

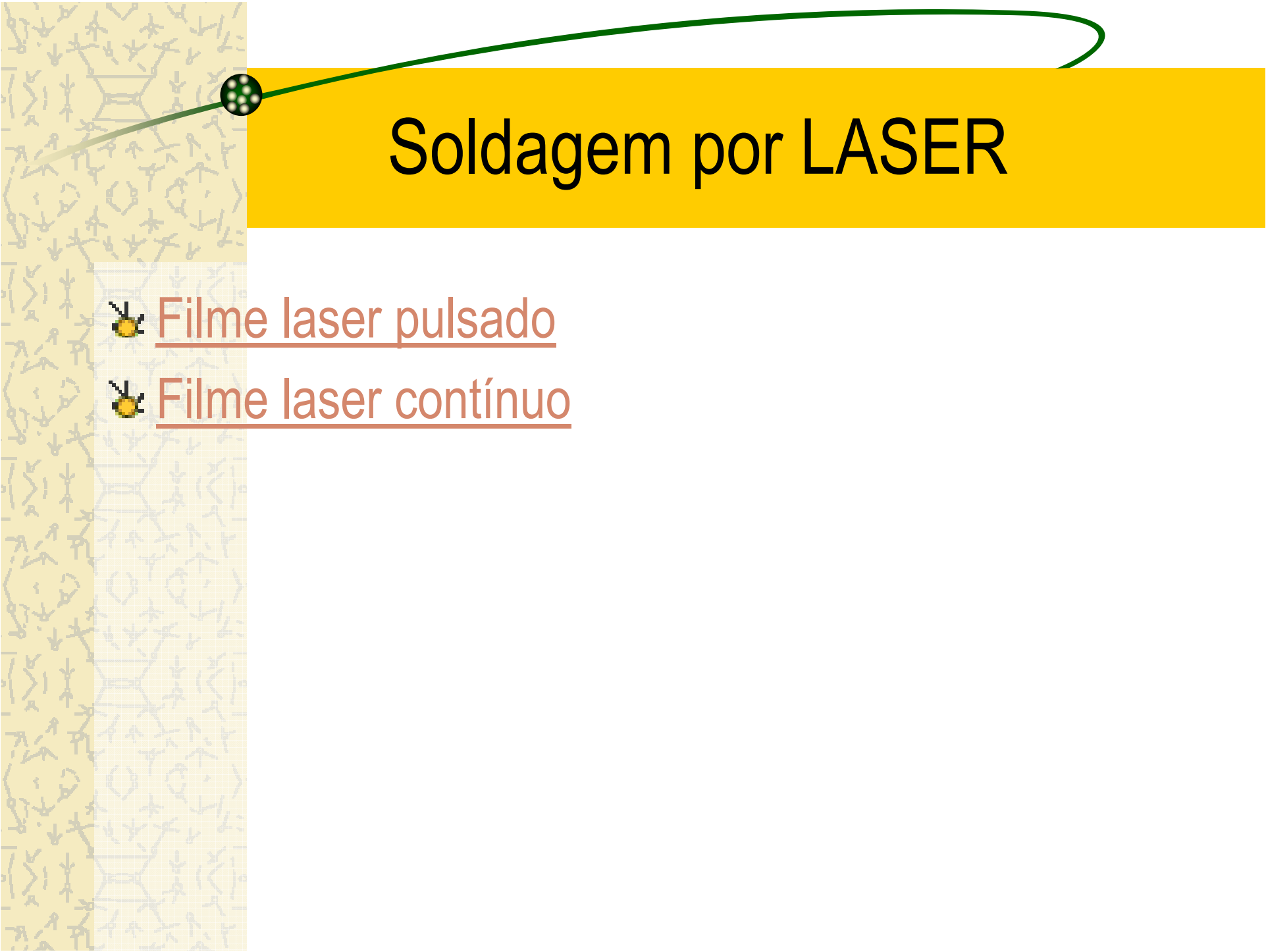


Penetração



Soldagem por LASER





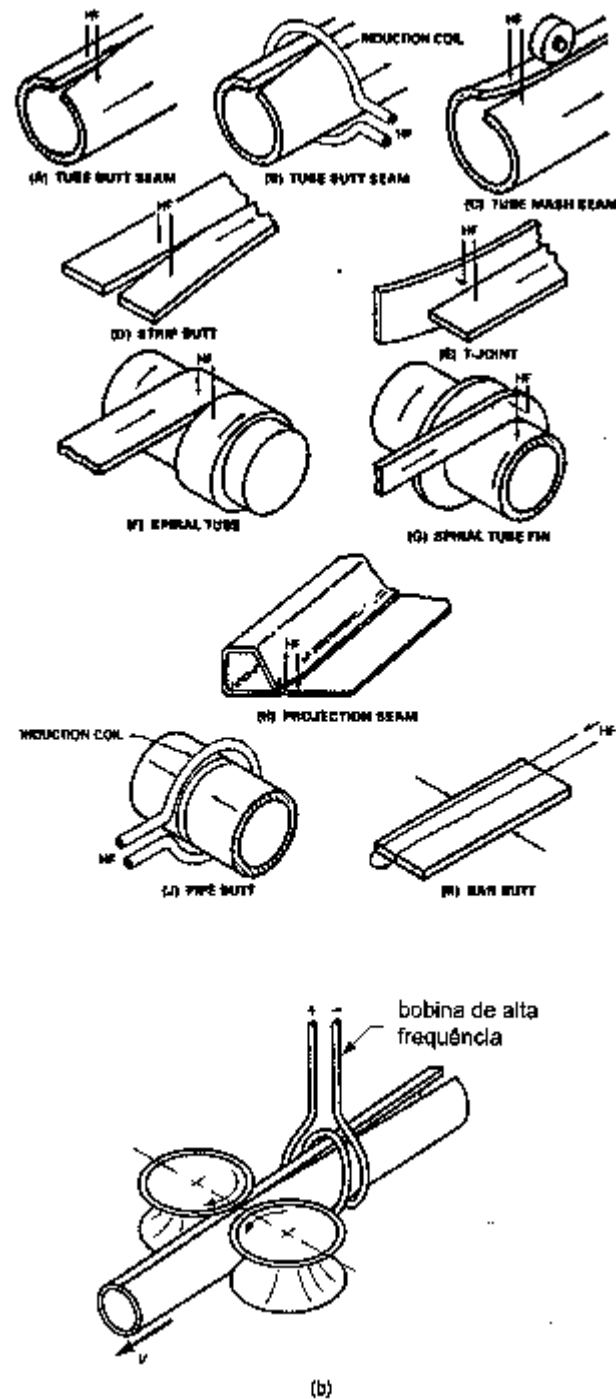
Soldagem por LASER

☀ Filme laser pulsado

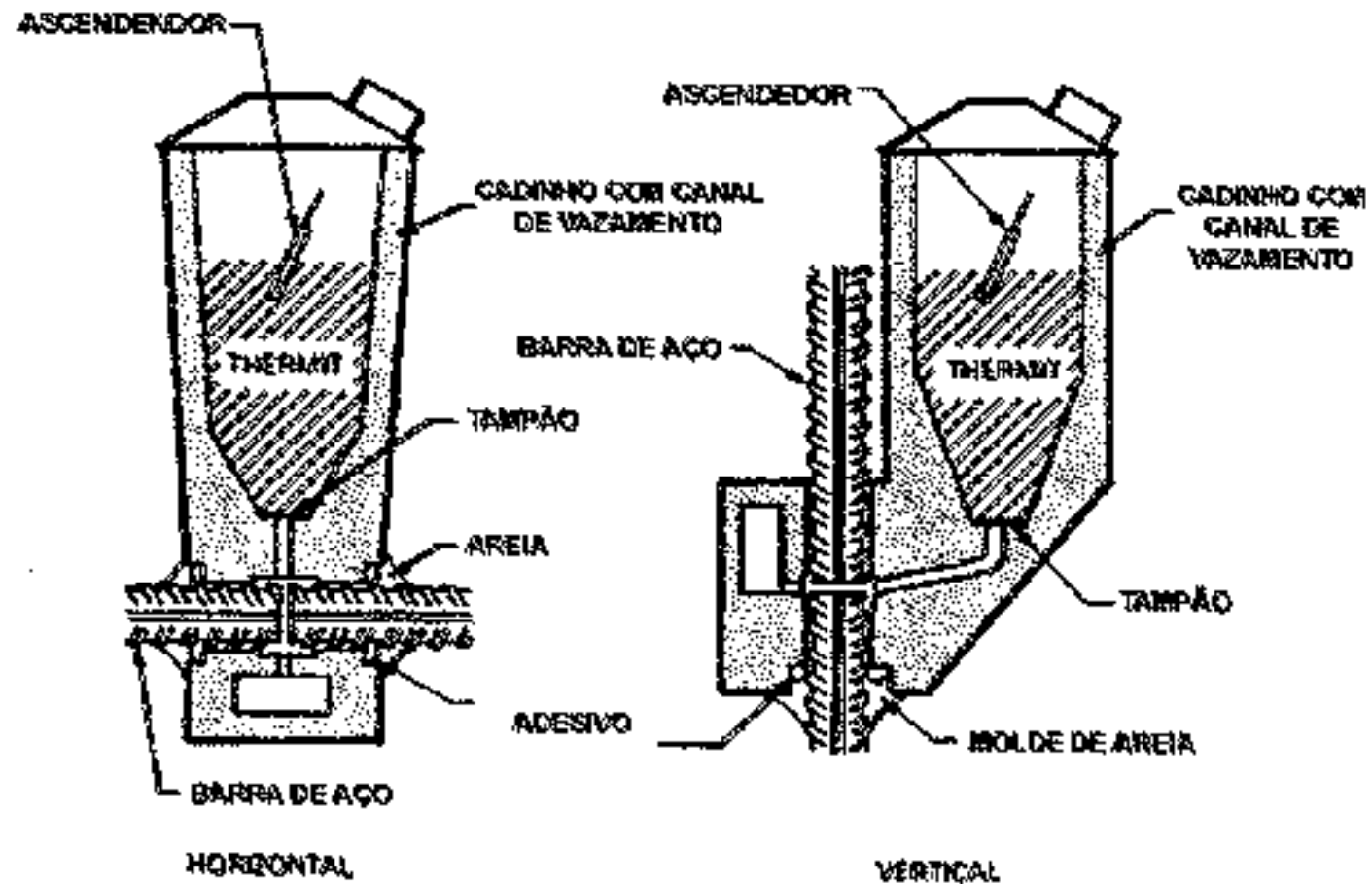
☀ Filme laser contínuo

Soldagem por Indução (SIN)

🔦 Filme

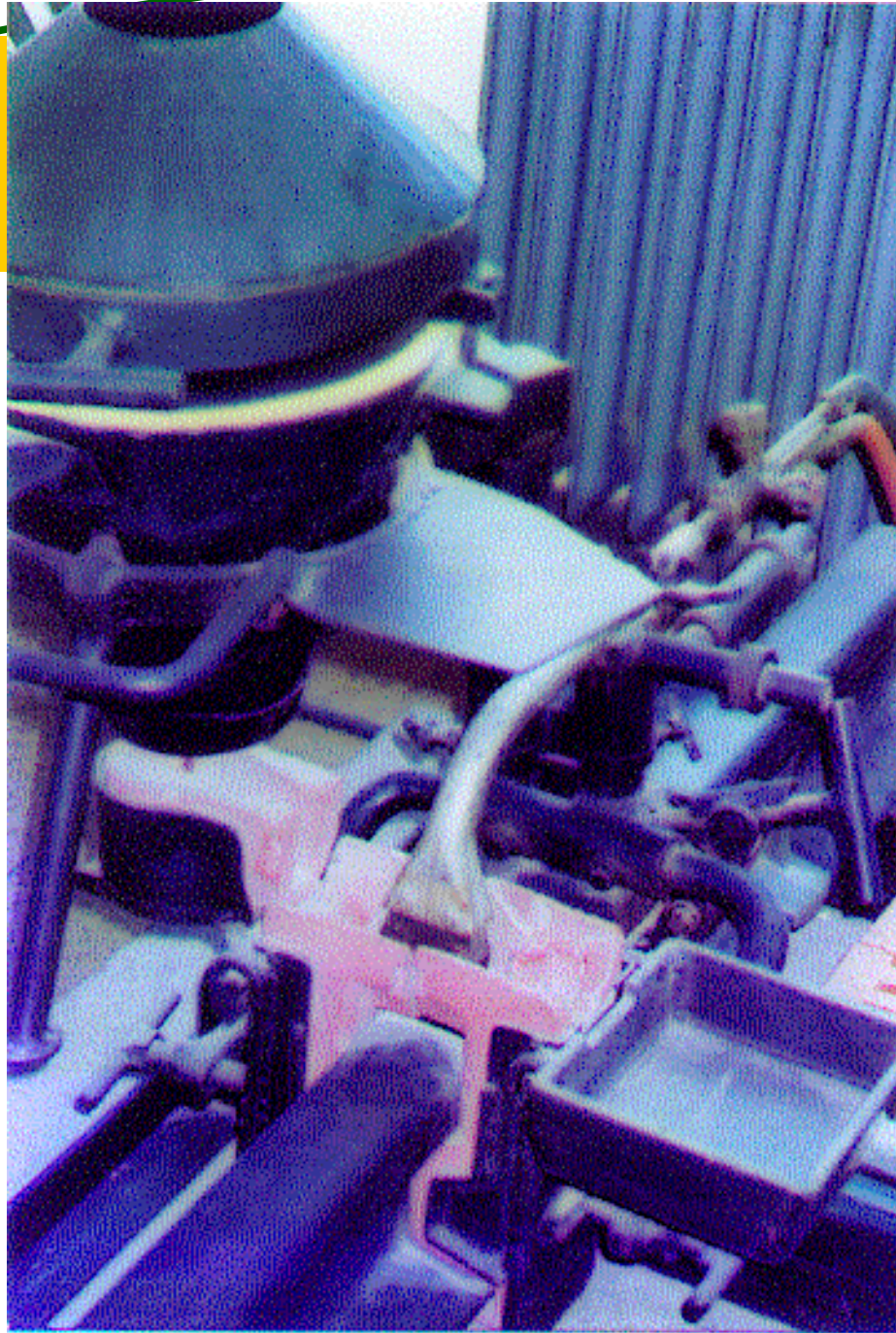


Soldagem por Aluminotermia (SAL)



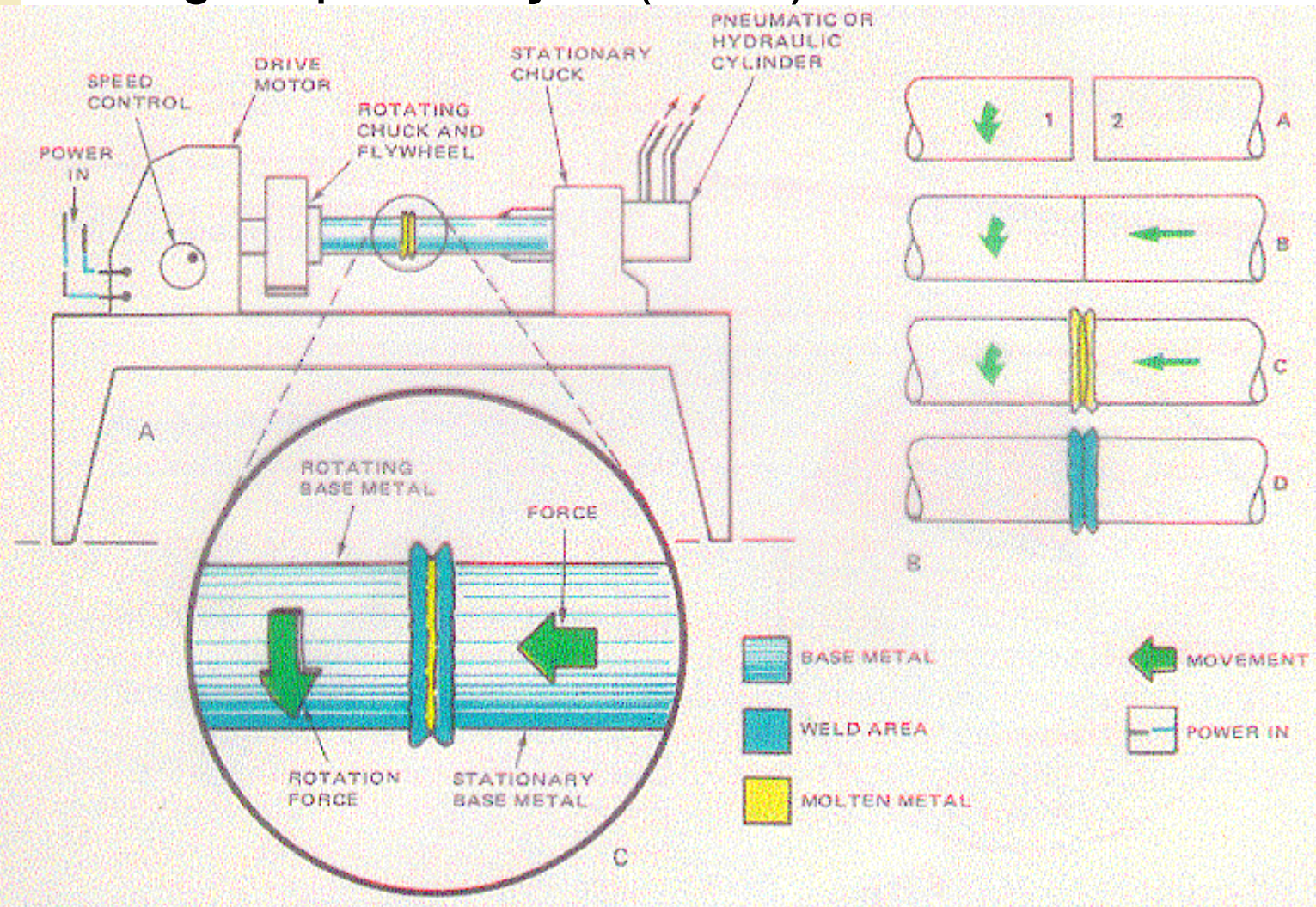


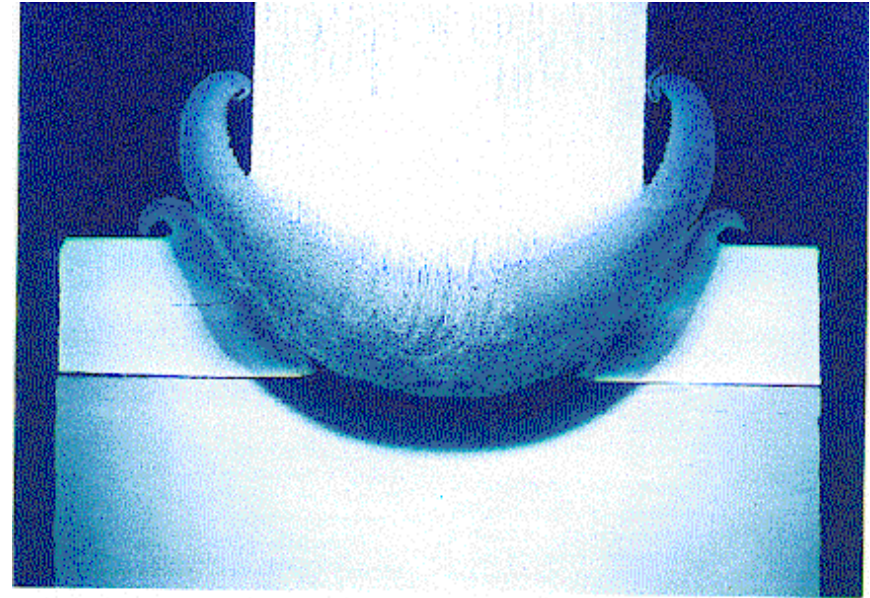
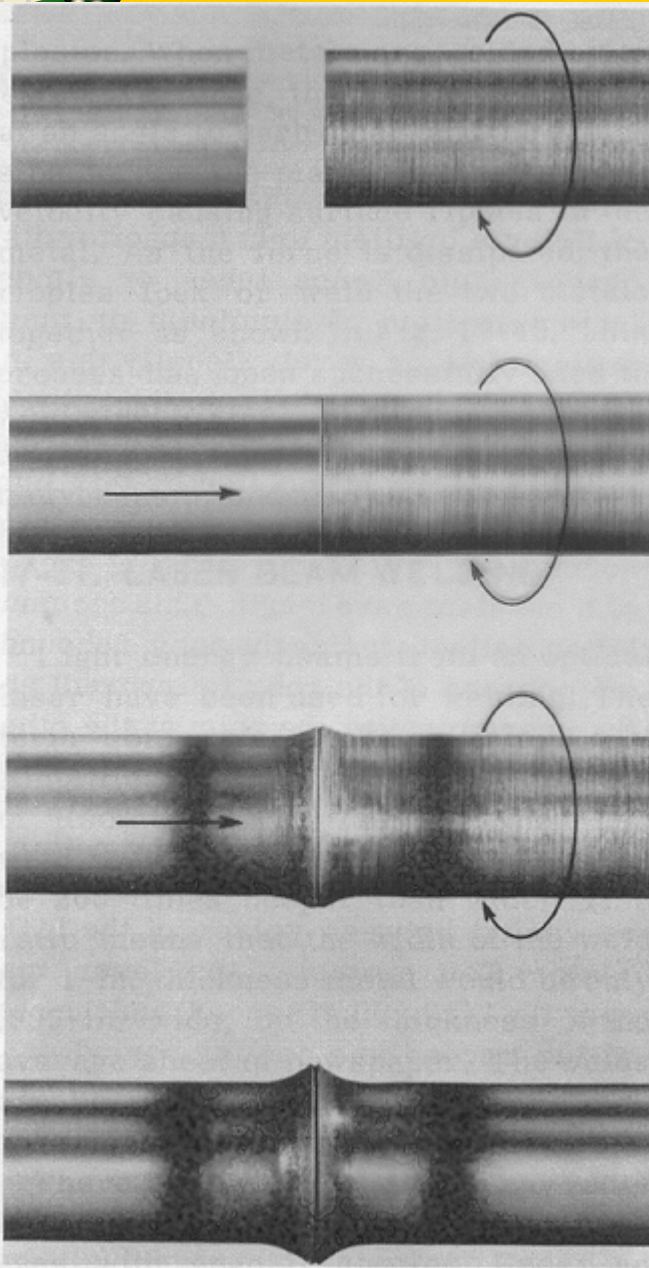
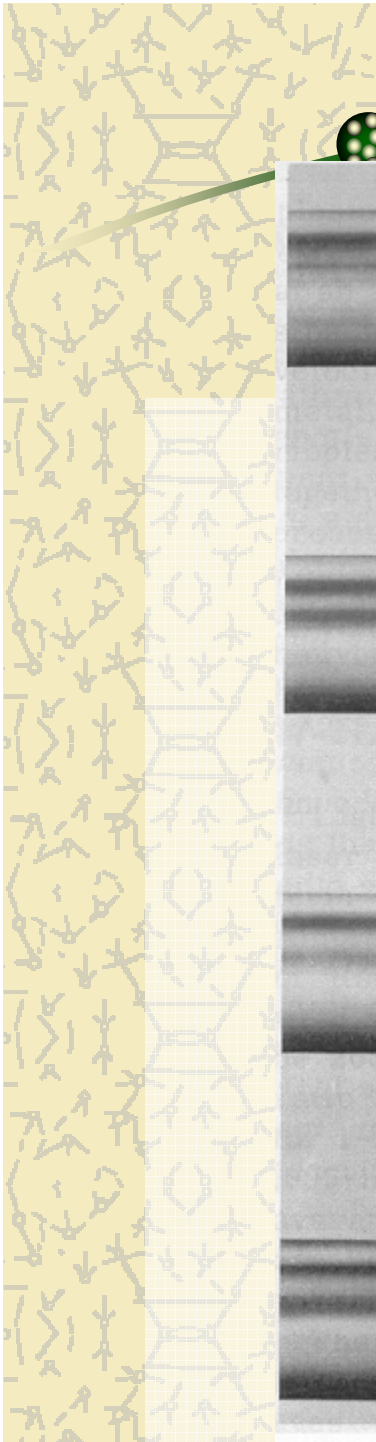
🔦 Filme



Soldagem no Estado Sólido

Soldagem por Fricção (SFRI)





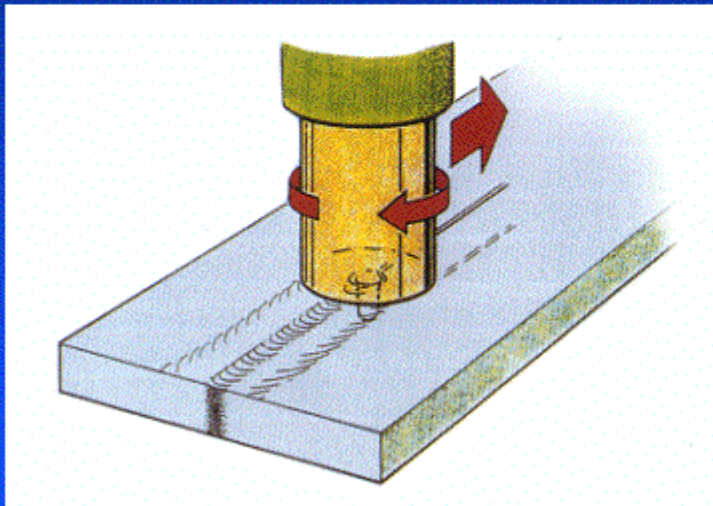
🔧 Filme Tarugo

🔧 Filme Tubo

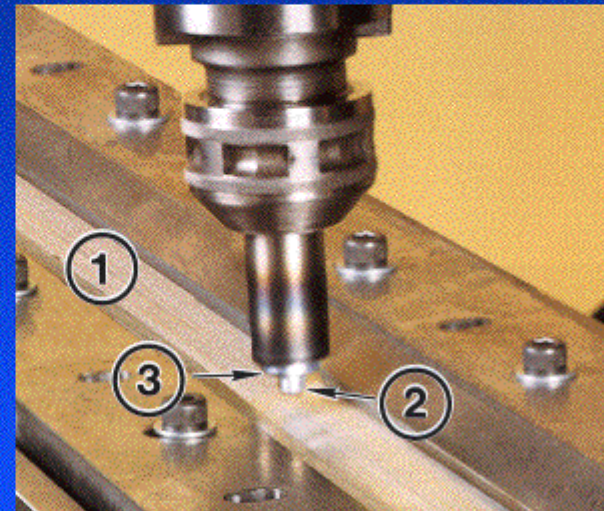
Soldagem por Fricção-Mistura

Friction Stir Welding

■ Principle



■ Example





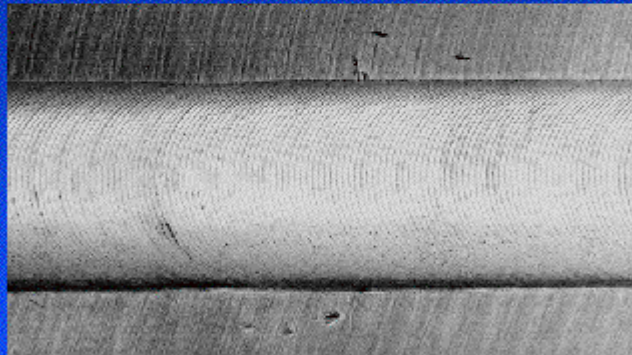
Soldagem por Fricção-Mistura

- ✱ Filme FSW liga Mg
- ✱ Filme FSW liga Al
- ✱ Filme FSW aço

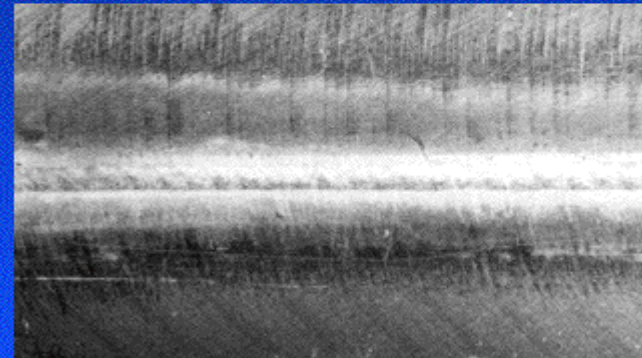
Soldagem por Fricção-Mistura

Typical weld appearance

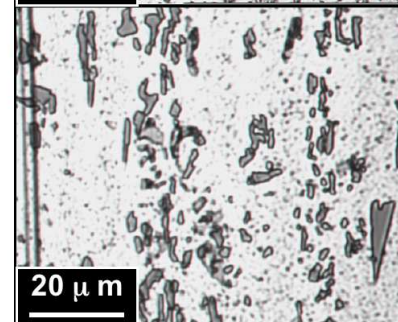
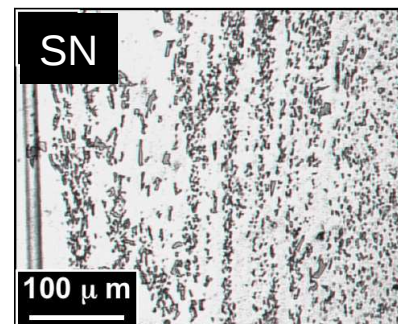
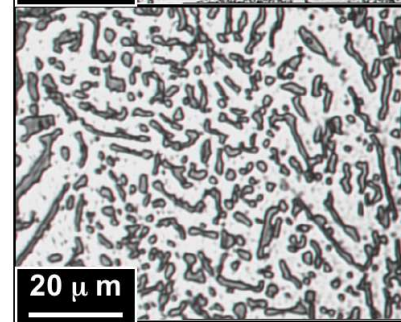
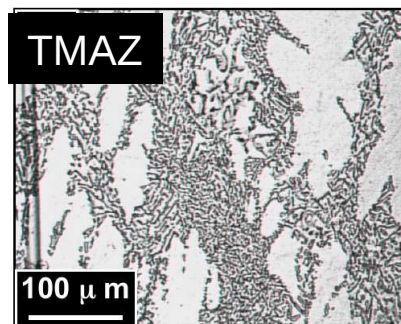
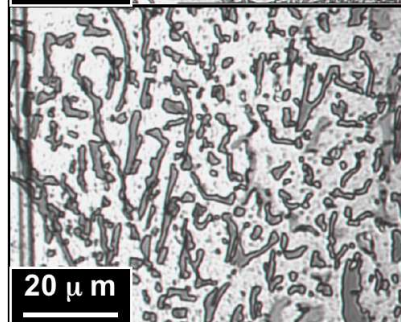
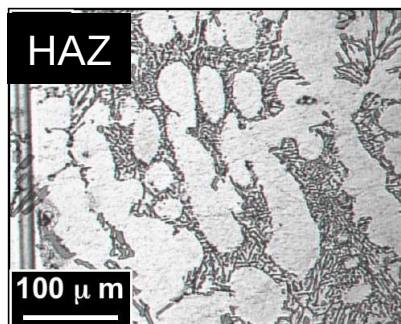
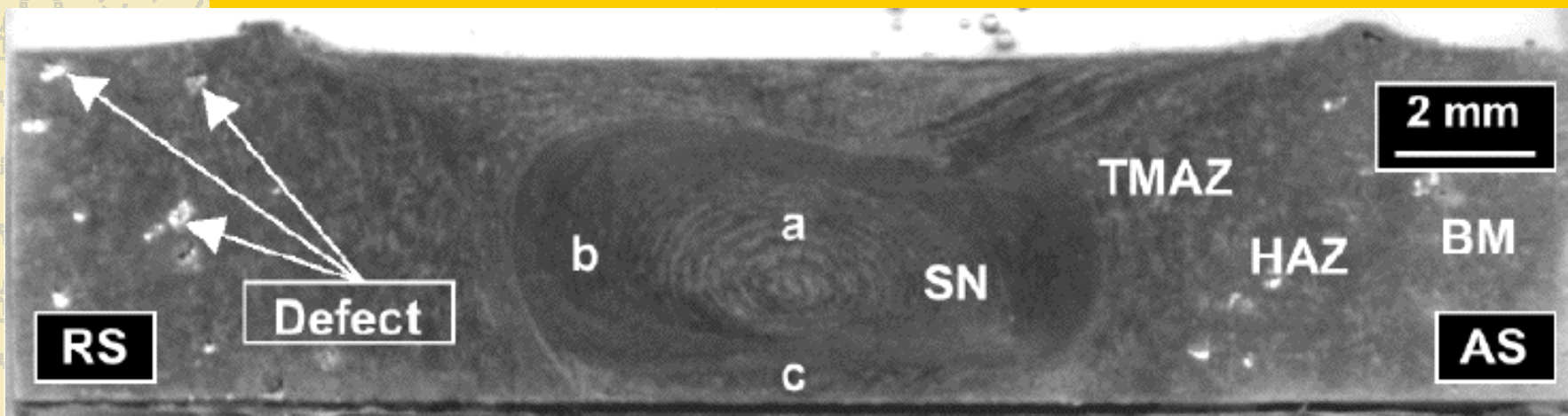
■ Top surface



■ Root surface

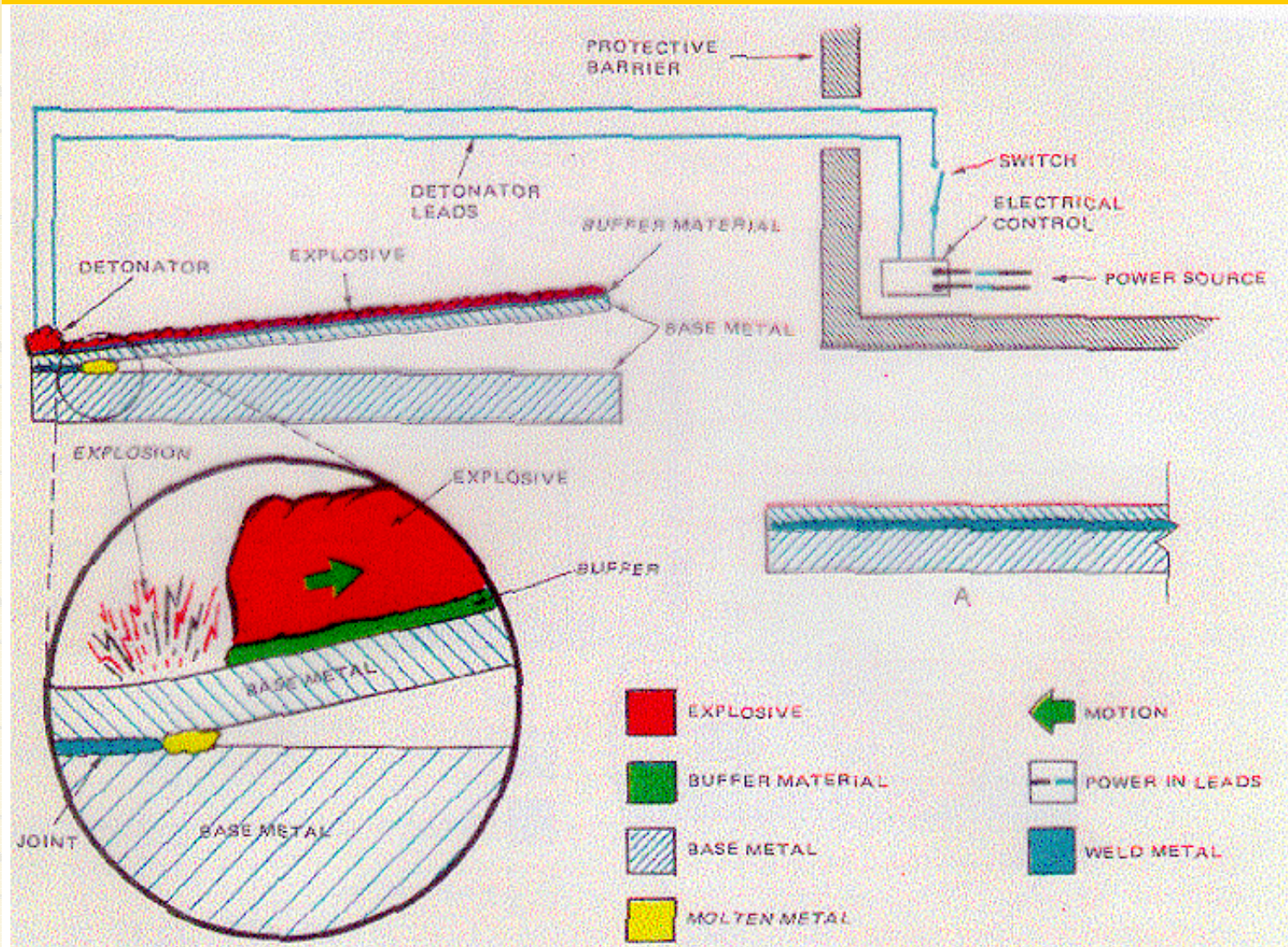


Microestrutura Típica

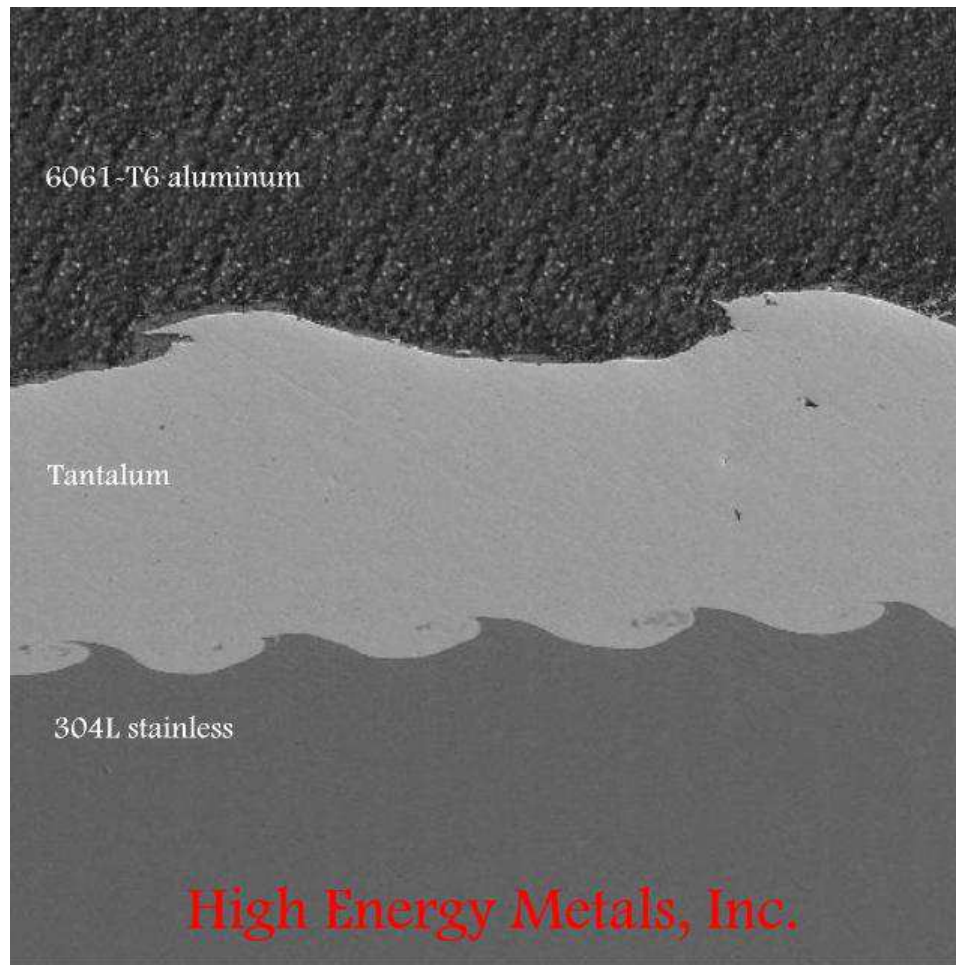


Liga Al-Si

Soldagem por Explosão (SEXP)



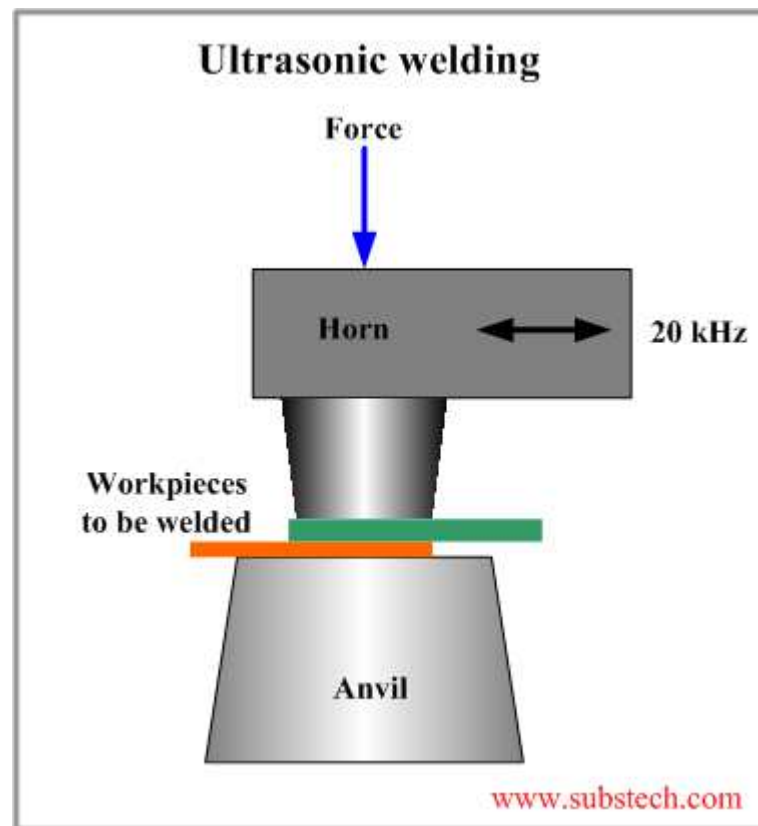
Soldagem por explosão



Animação

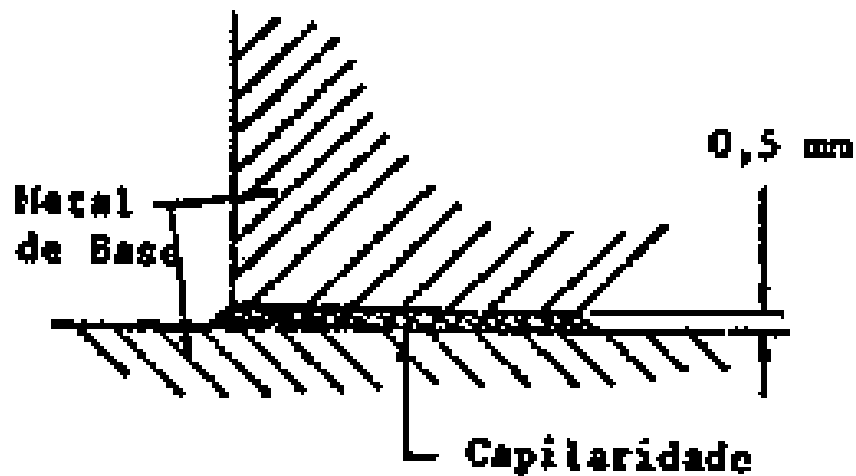
Filme

Soldagem por Ultrassom

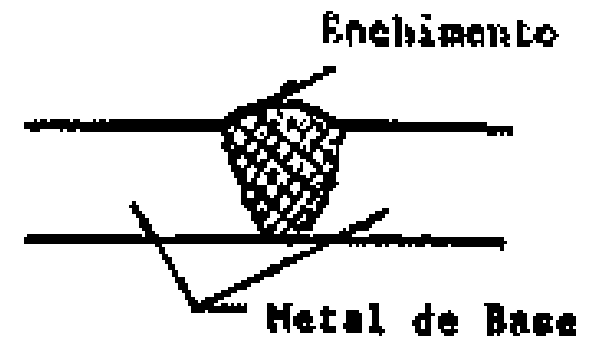


Filme

Brasagem ($T > 450^{\circ}\text{C}$)



(a) Brasagem

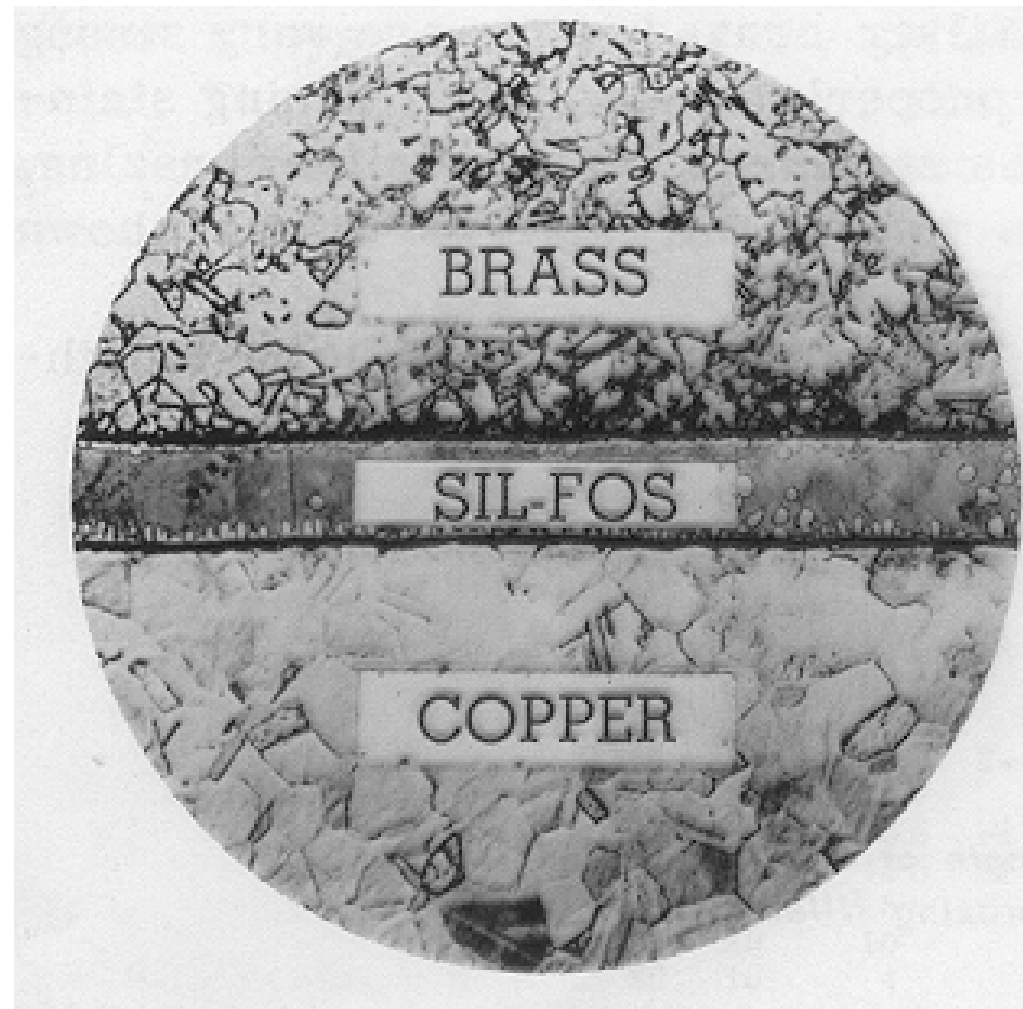


(b) Solda-brasagem

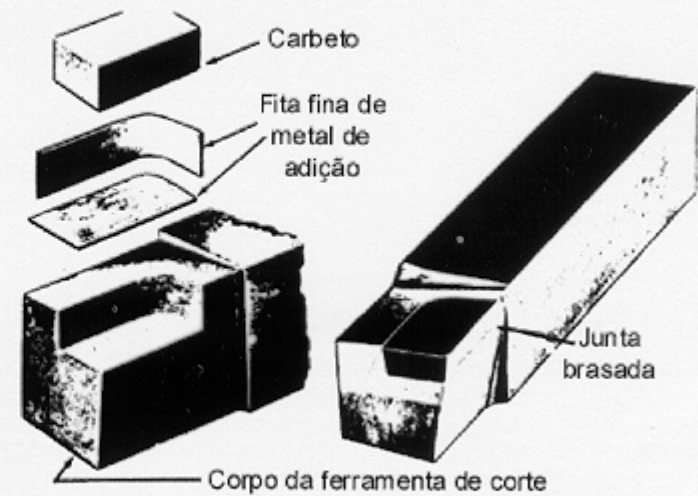
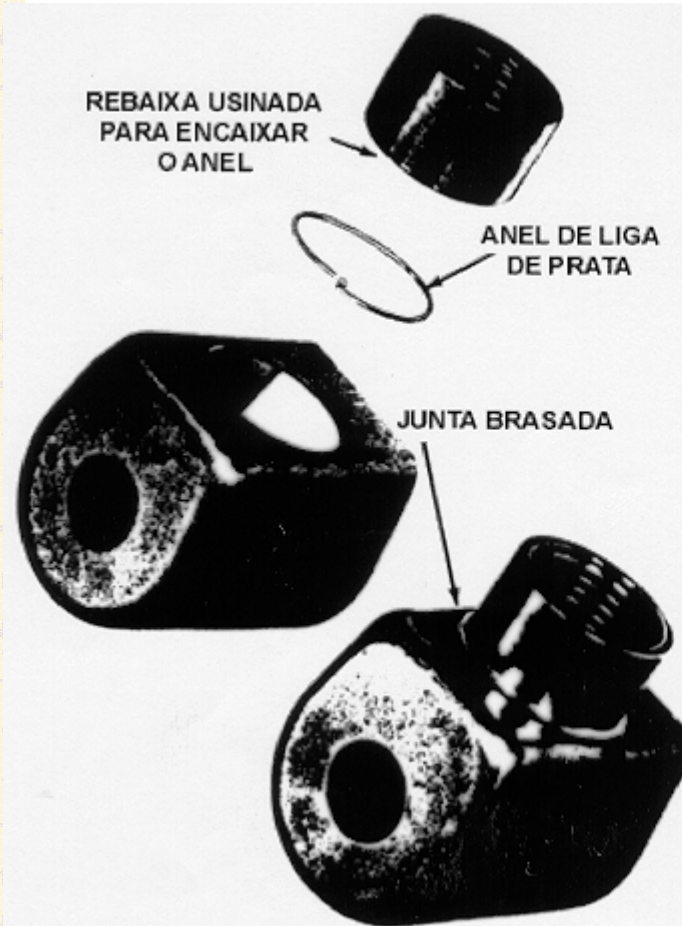
BRASAGEM E SOLDA-BRASAGEM

Simulação Ni-Cu (capilar de 10 nm)

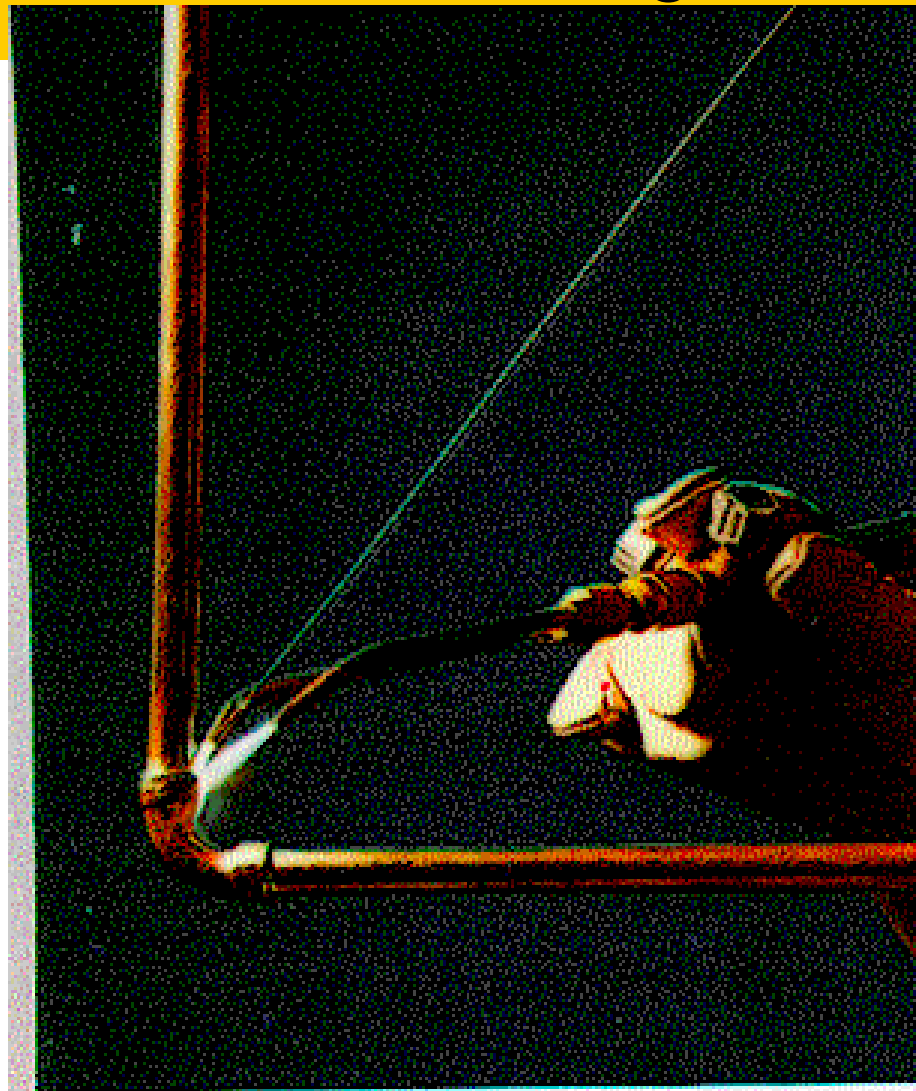
Brasagem



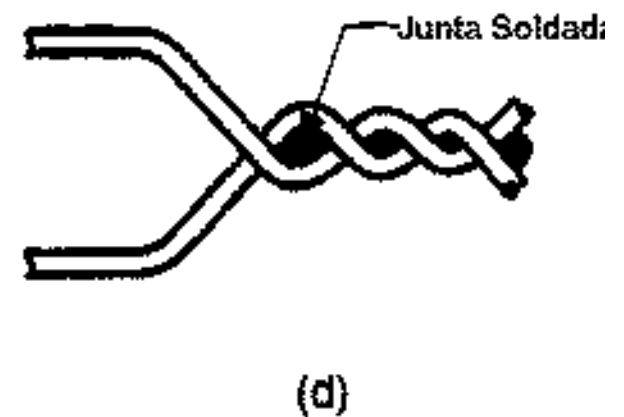
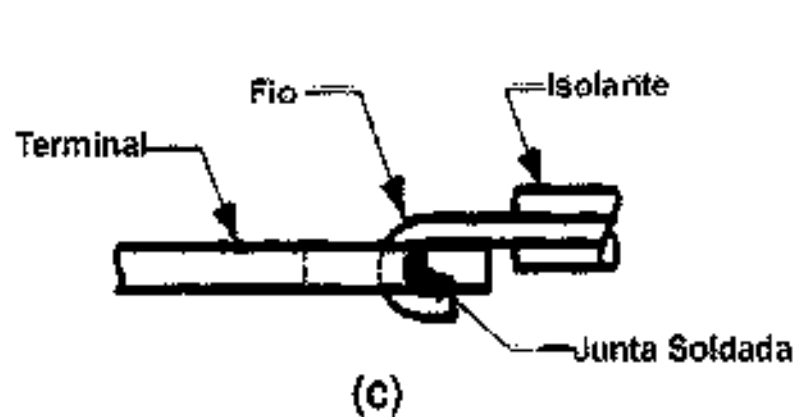
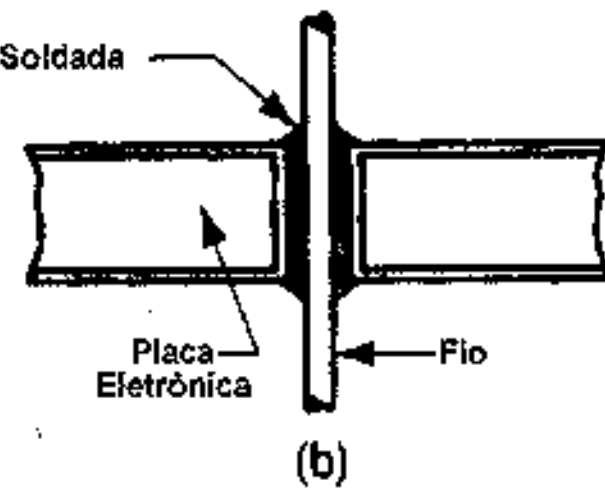
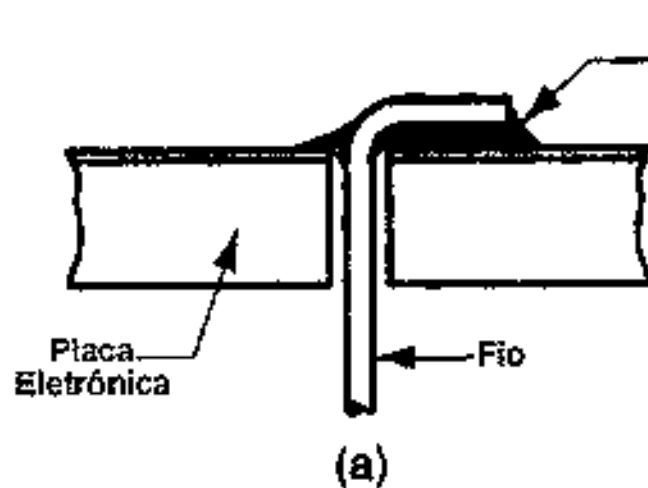
Brasagem



Solda Brasagem

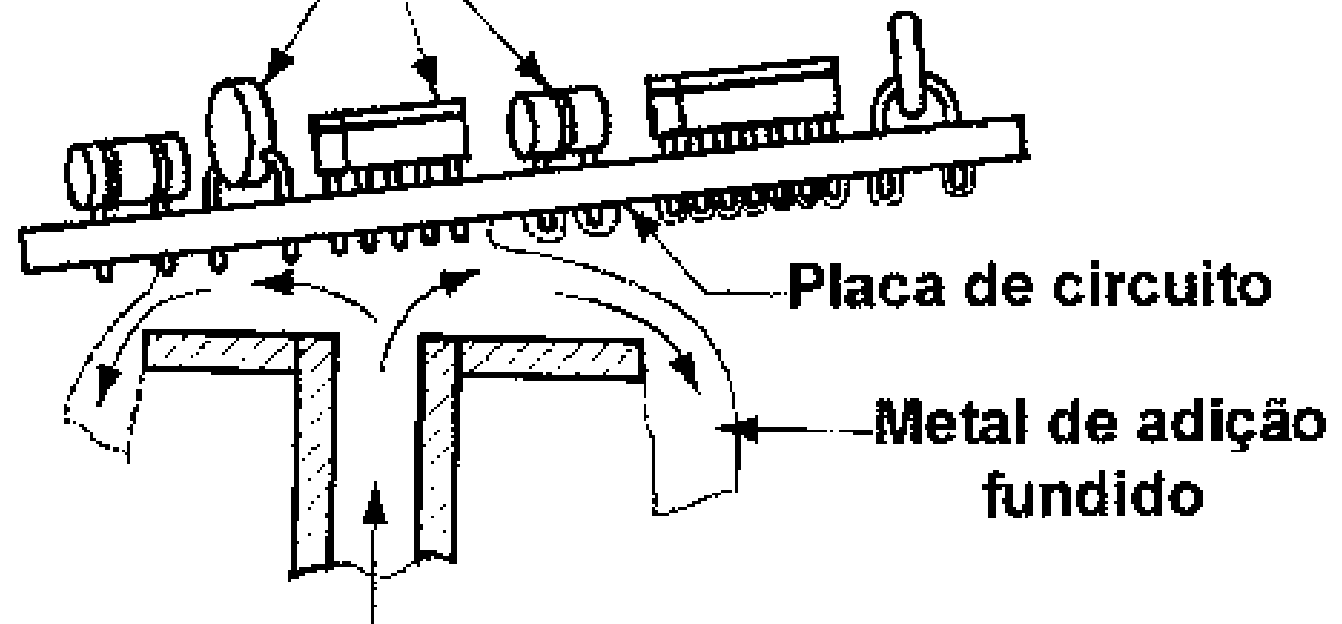


Solda Branda ($T < 450^{\circ}\text{C}$)

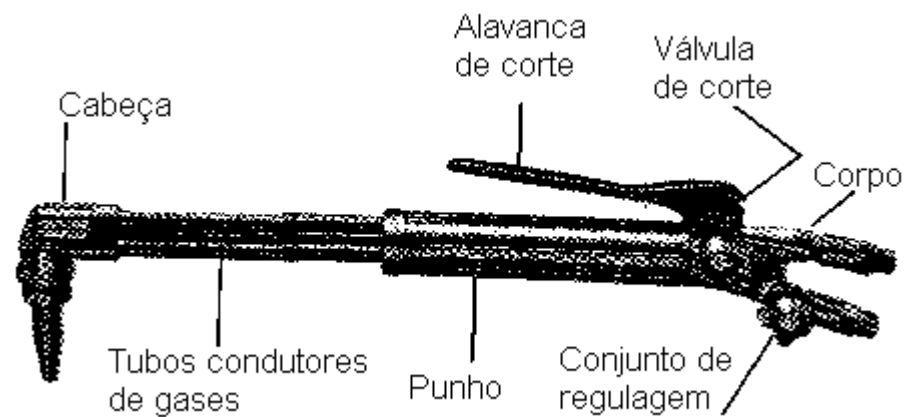
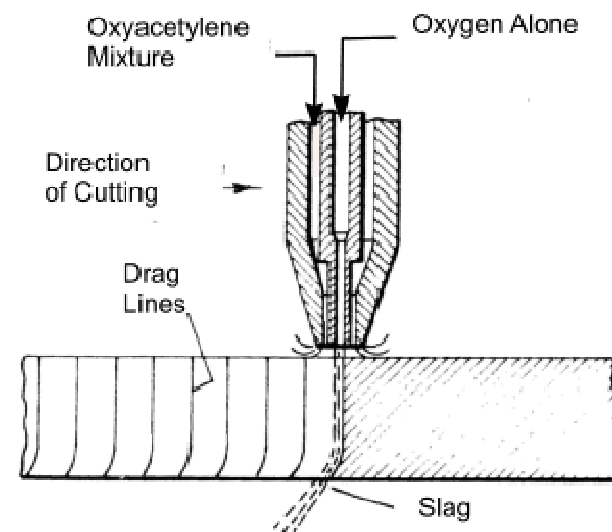


Solda Branda

Componentes



Oxicorte



Filme

Oxicorte



correto



muito rápido

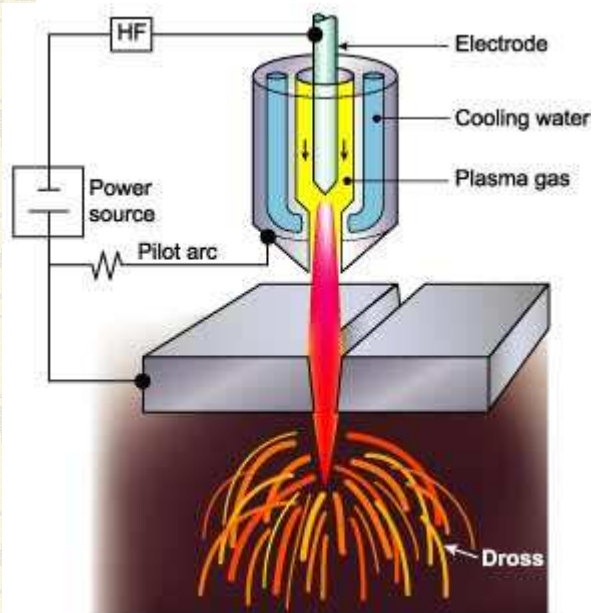


bico muito distante da chapa



fluxo de O_2 muito alto

Corte a plasma

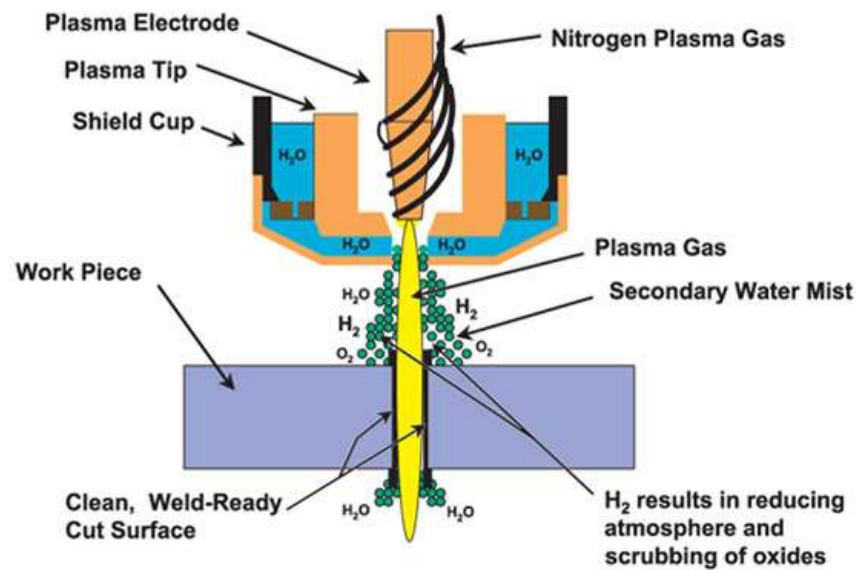


Filme



Corte a plasma

Effect of N_2/H_2O Plasma on Non-Ferrous



Não ferrosos

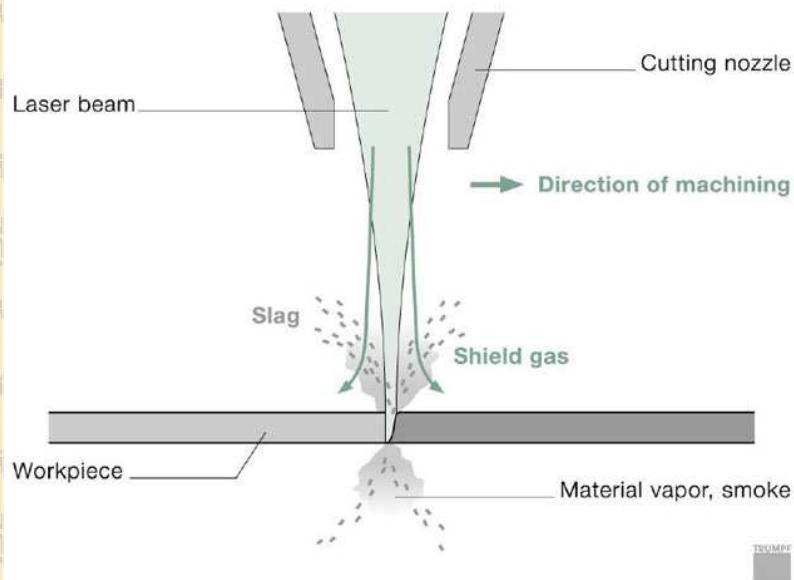


Corte a LASER



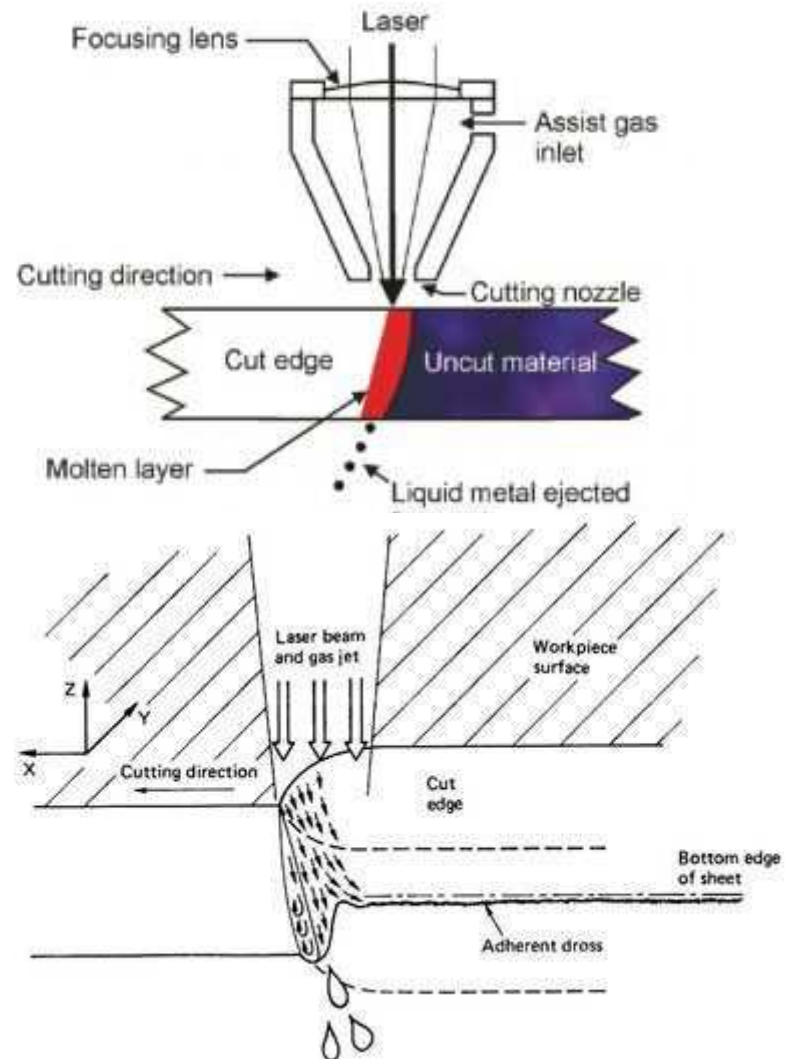
Filme

Corte a LASER



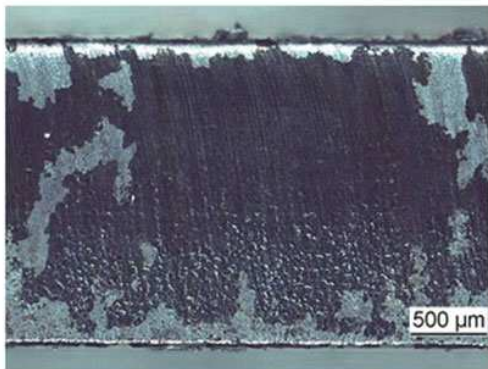
Sublimação
(chapas muito finas)

Fusão + fluxo de gás

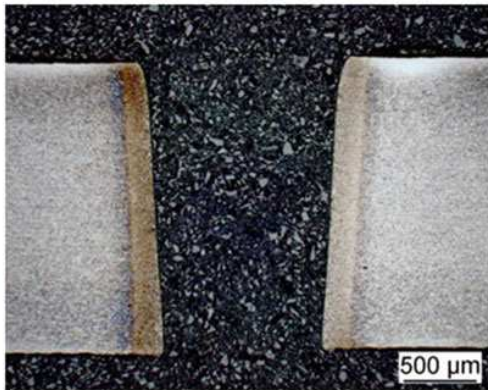


Plasma x LASER

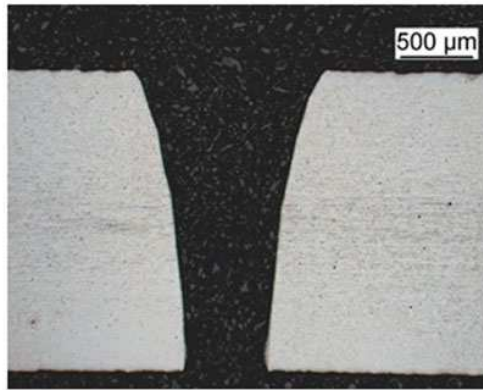
Cut surface



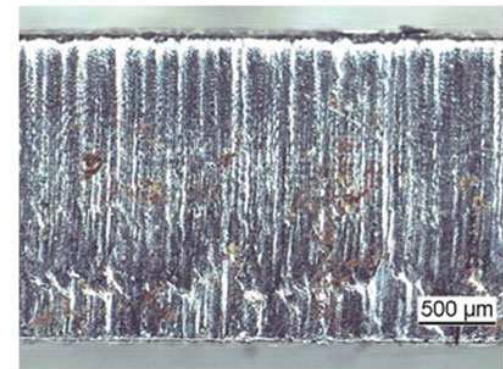
Cross-section



O₂-Plasma cutting



N₂-Plasma cutting



Laser cutting

Bibliografia

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- ✚ KALPAKJIAN, Serope e SCHMID, Steven. Manufacturing processes for engineering materials, 5a ed., Pearson Education, New Jersey, 2007.
- ✚ Emilio Wainer, Sergio Duarte Brandi e Fabio Decourt Homem de Mello. Soldagem: processos e metalurgia, São Paulo: Edgard Blucher, 1992.
- ✚ Paulo Villani Marques. Tecnologia da soldagem, Belo Horizonte: Esab, 1991.
- ✚ AWS Welding Handbook, vol. 2.
- ✚ ASM International. ASM Handbooks Online, vol. 6A e vol. 6, <http://products.asminternational.org/hbk/index.jsp>