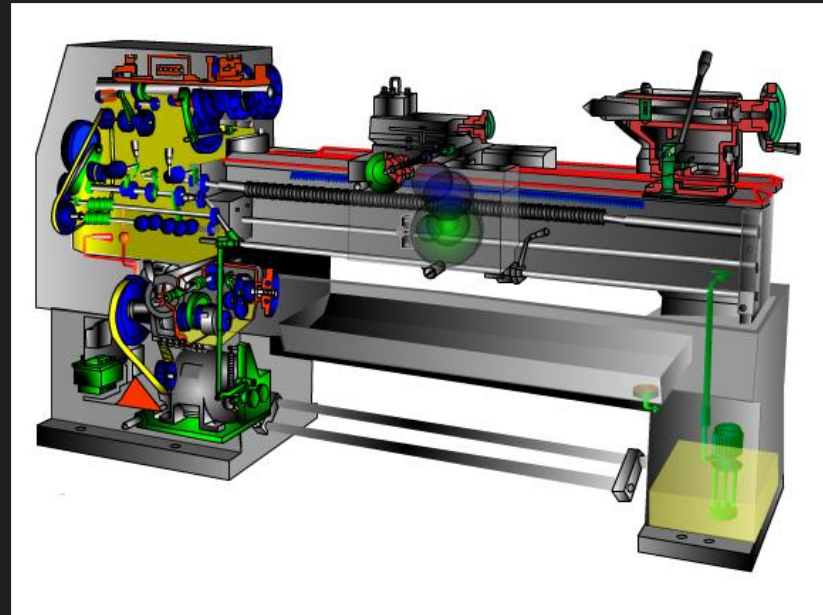
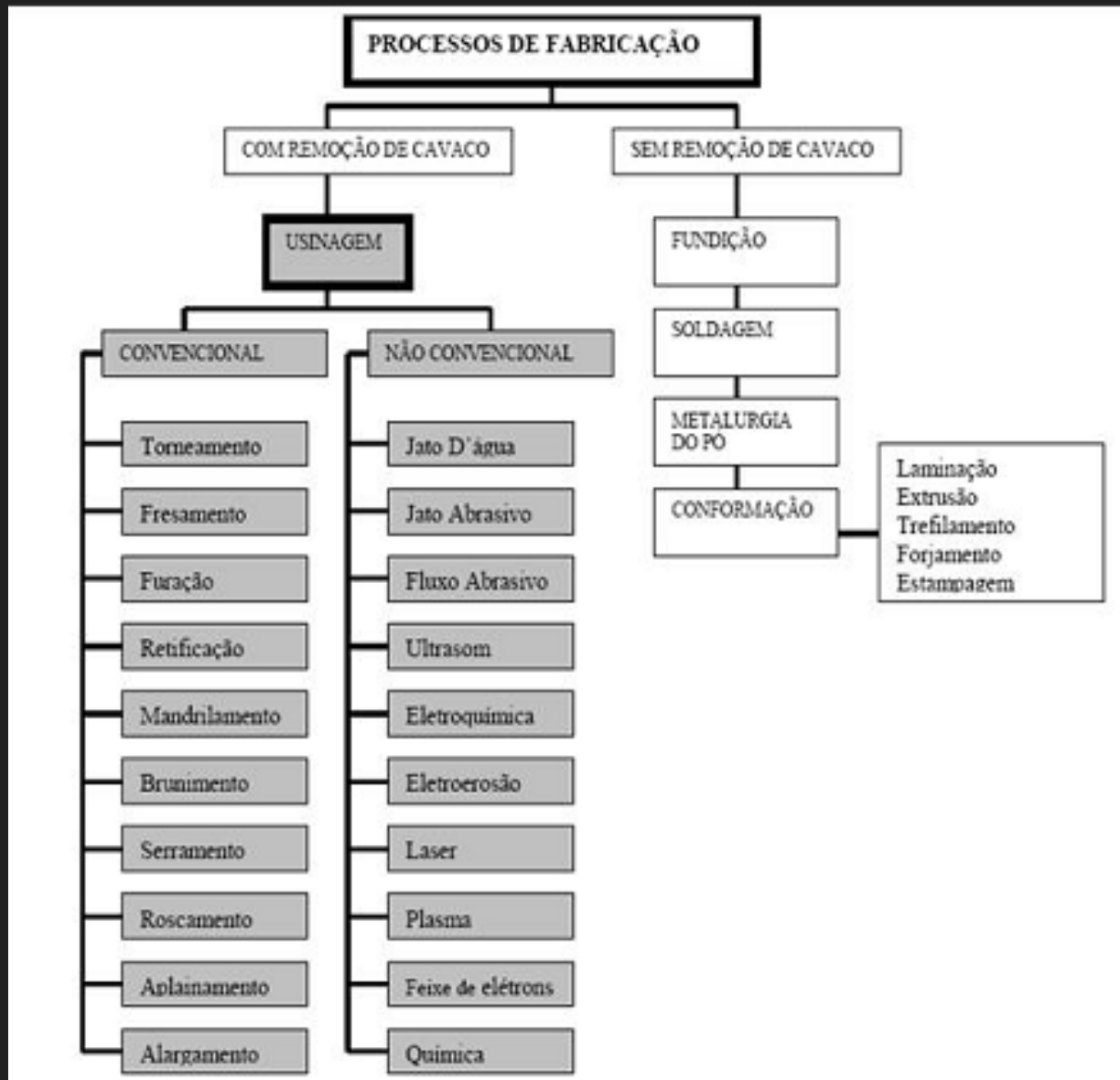


Tecnologia de Usinagem I

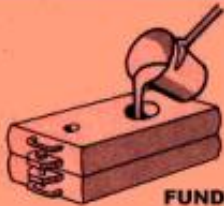


Prof. Milton
Fatec Itaquera Prof. Miguel Reale / 2014

Principais processos de Fabricação



Processos sem a retirada de cavaco



FUNDIÇÃO



LAMINAÇÃO



TREFILAÇÃO

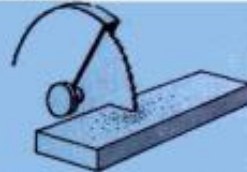


FORJAMENTO



CORTE

Processos com a retirada de cavaco



SERRAGEM



FURAÇÃO



TORNEAMENTO



APLAINAMENTO



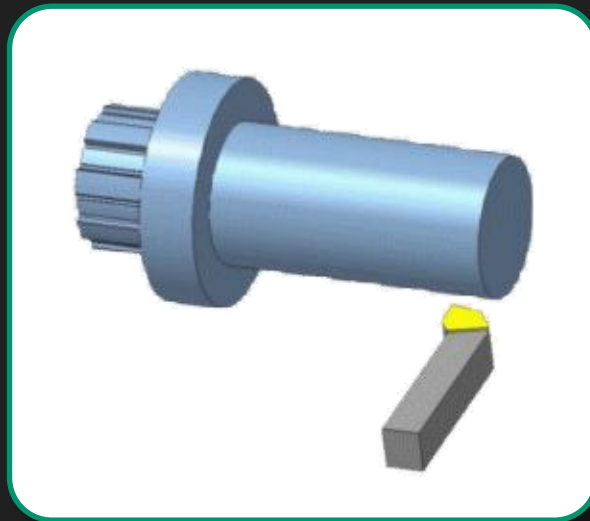
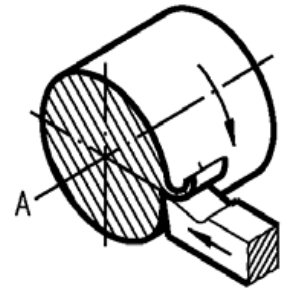
FRESAMENTO

**A USINAGEM NO
CONTEXTO DOS
PROCESSOS DE
FABRICAÇÃO**

Introdução

Torneamento - Tornos

Processo que se baseia no movimento da peça em torno de seu próprio eixo chama-se torneamento.



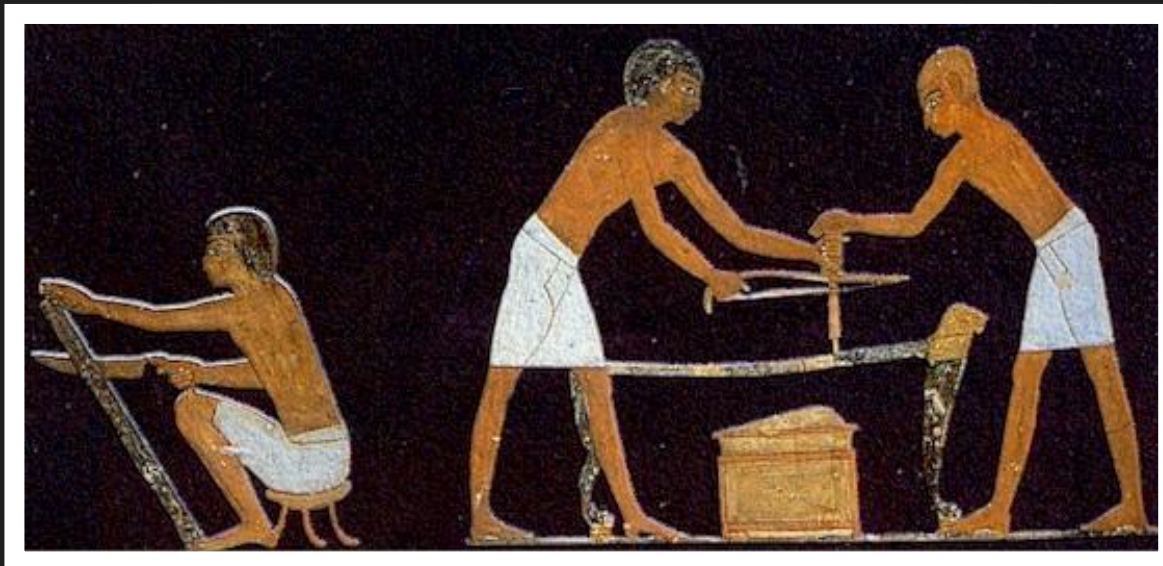
Torneamento - Tornos

Tornos são máquinas-ferramenta que permitem usinar peças de forma geométrica que necessitam de rotação, como eixos, polias, pinos, roscas, peças cilíndricas, cones e esferas.



Torneamento - Tornos

Essencial para o desenvolvimento tecnológico, o torno é a mais antiga máquina-ferramenta desenvolvida pelo homem.



FURAÇÃO

Fig.19 - Furação em cheio

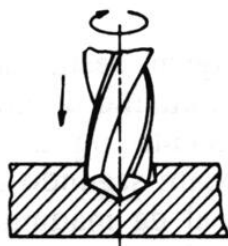


Fig.20- Furação com pré-furação

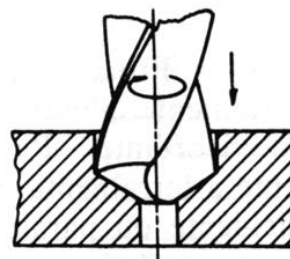


Fig.21 - Furação escalonada

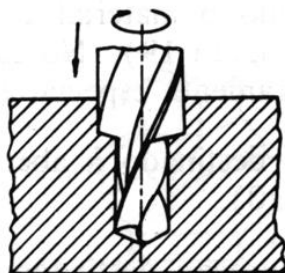


Fig.22- Furação de centros

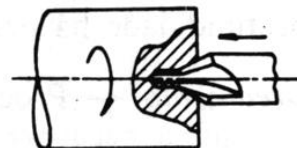


Fig.23 - Furação profunda em cheio

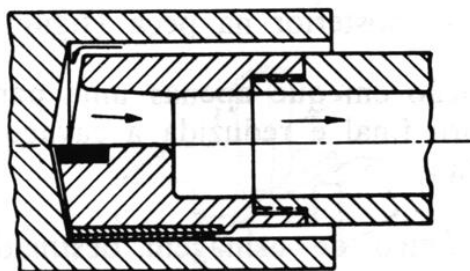
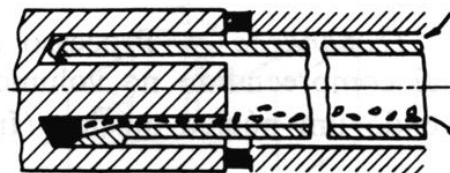
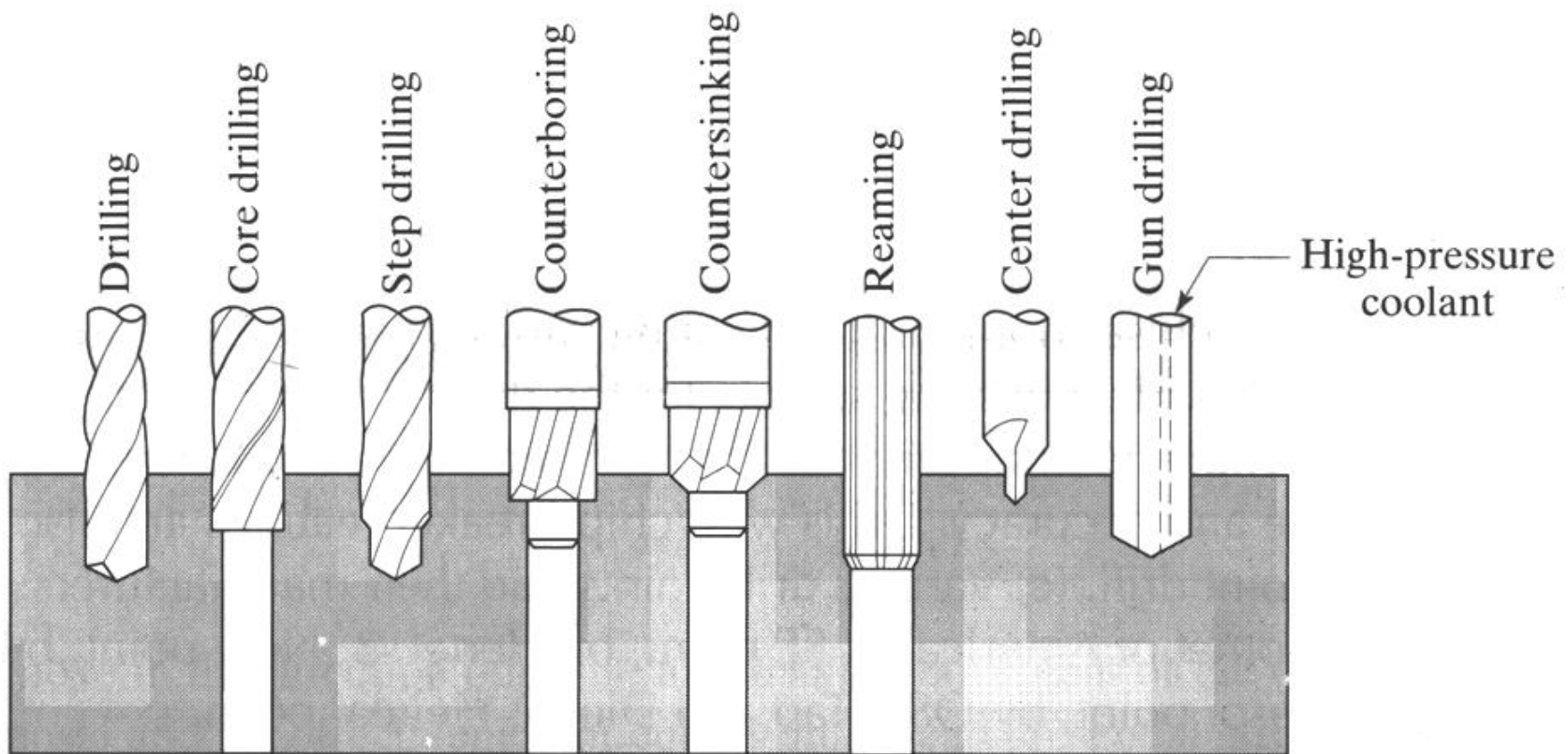


Fig.24 - Trepanação



FURAÇÃO



Various types of drilling and reaming operations.

OPERAÇÕES COMPLEMENTARES A FURAÇÃO

ALARGAMENTO CILÍNDRICO

Fig.25 - Alargamento cilíndrico de desbaste

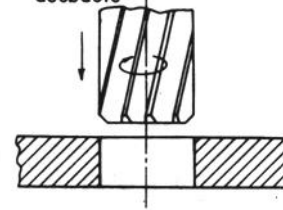
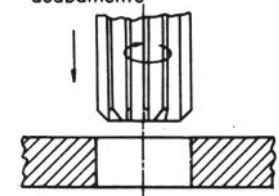


Fig.26 - Alargamento cilíndrico de acabamento



ALARGAMENTO CÔNICO

Fig.27- Alargamento cônico de desbaste

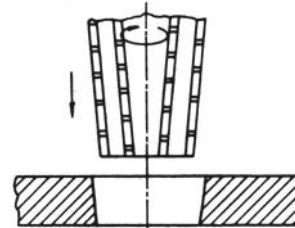
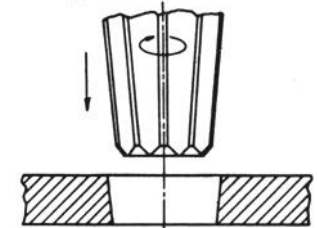


Fig.28- Alargamento cônico de acabamento



REBAIXAMENTO

Fig.29- Rebaixamento guiado

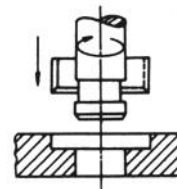


Fig.30 - Rebaixamento

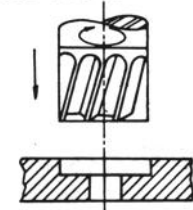


Fig.31- Rebaixamento guiado

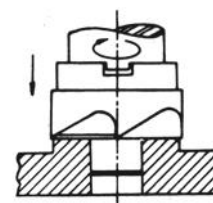
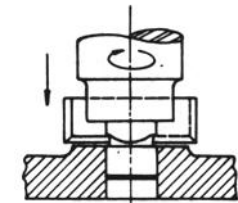
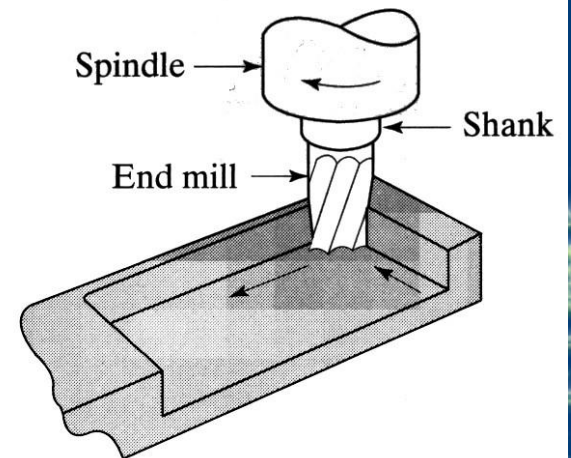
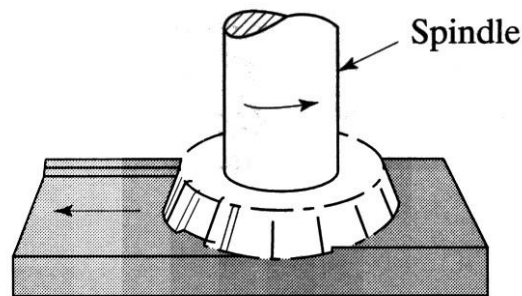
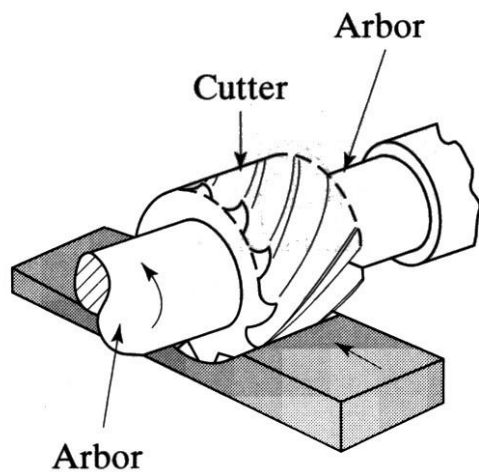
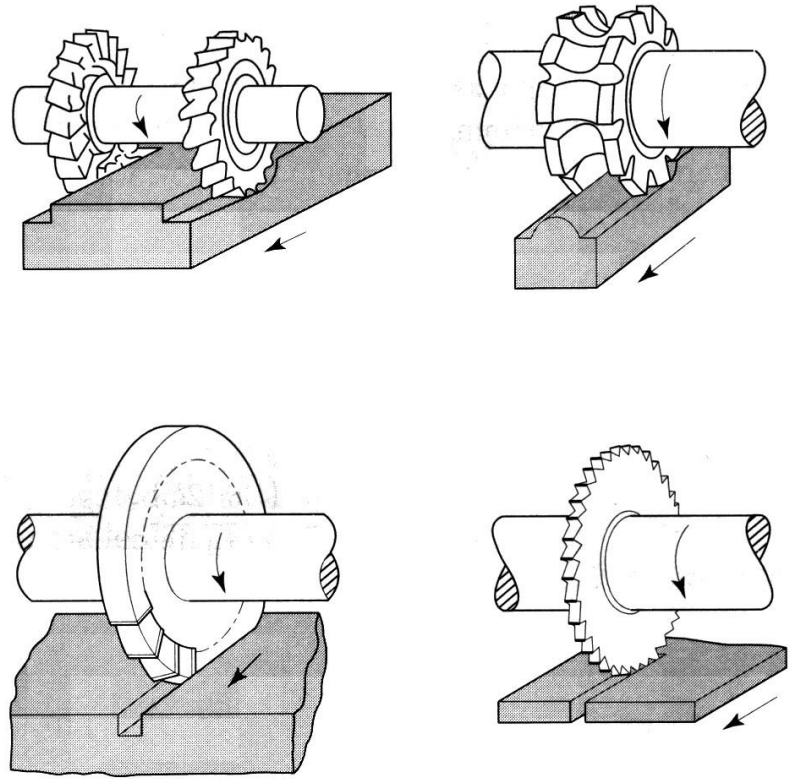


Fig.32- Rebaixamento guiado



FRESAMENTO



APLAINAMENTO

APLAINAMENTO

Fig.11 - Aplainamento de guias

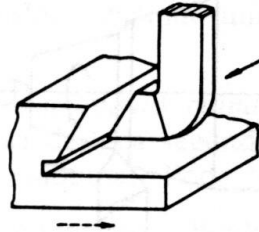


Fig.12- Aplainamento de superficies

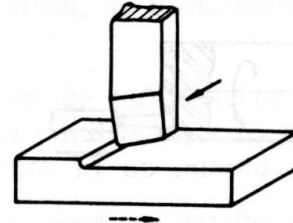


Fig.13 - Aplainamento de perfis

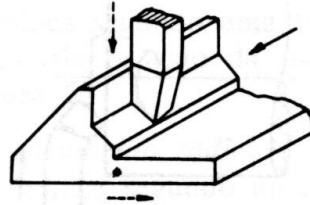


Fig.14 - Aplainamento de rasgo de chaveta

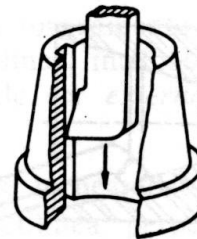


Fig.15 - Aplainamento de rasgos

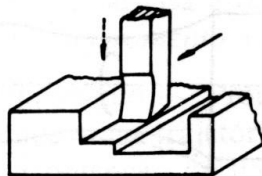
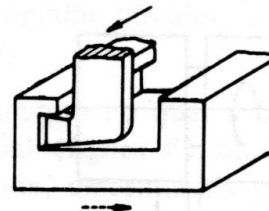


Fig.16 - Aplainamento de ranhuras em "T"



APLAINAMENTO

Fig.17 - Aplainamento de sup. cilíndricas de revolução

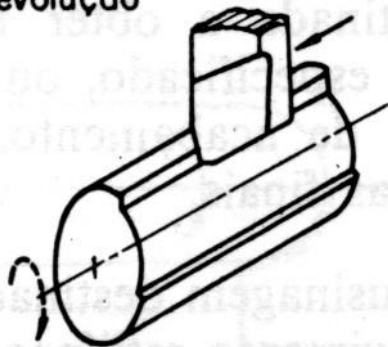
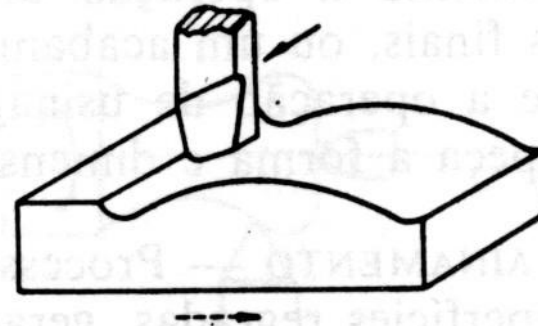


Fig.18 - Aplainamento de sup. cilíndricas



MANDRILAMENTO

MANDRILAMENTO

Fig 35 - Mandrilamento cilíndrico

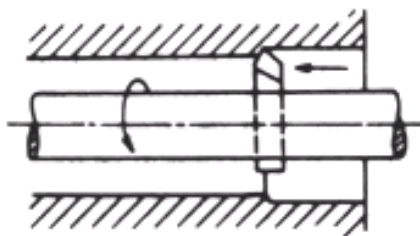


Fig.36- Mandrilamento radial

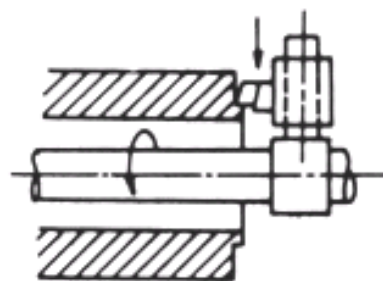


Fig.37- Mandrilamento cônico

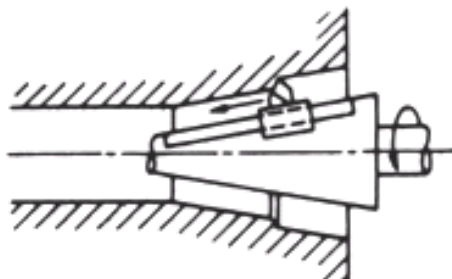
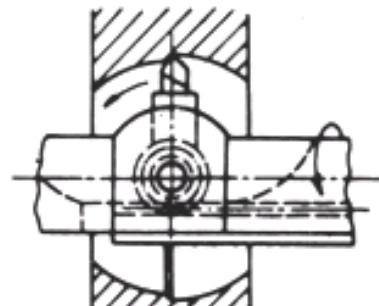


Fig.38- Mandrilamento esférico



BROCHAMENTO

BROCHAMENTO

Fig.55- Brochamento interno

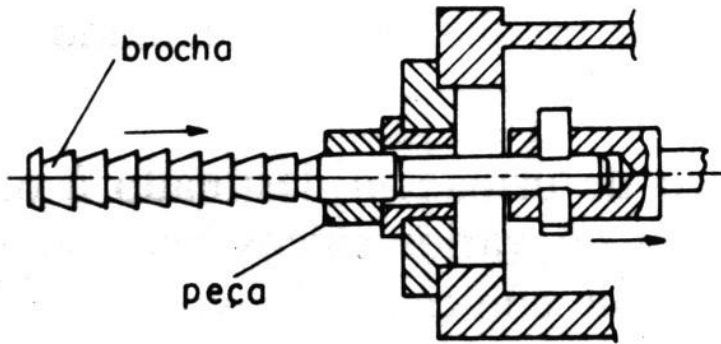
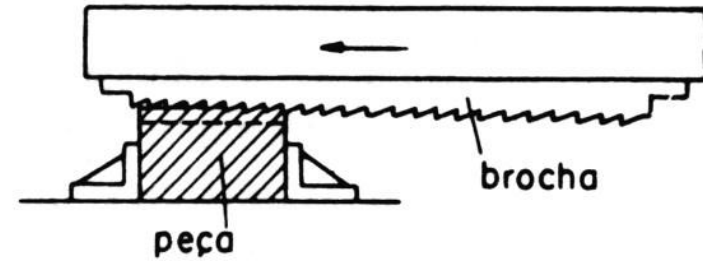
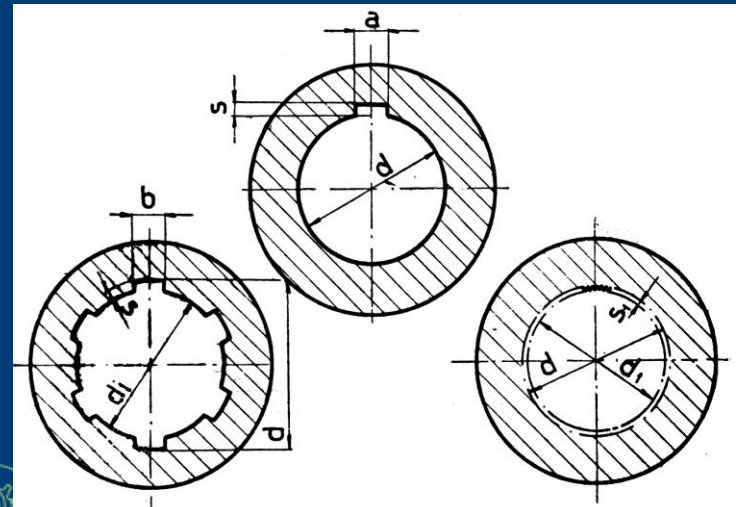
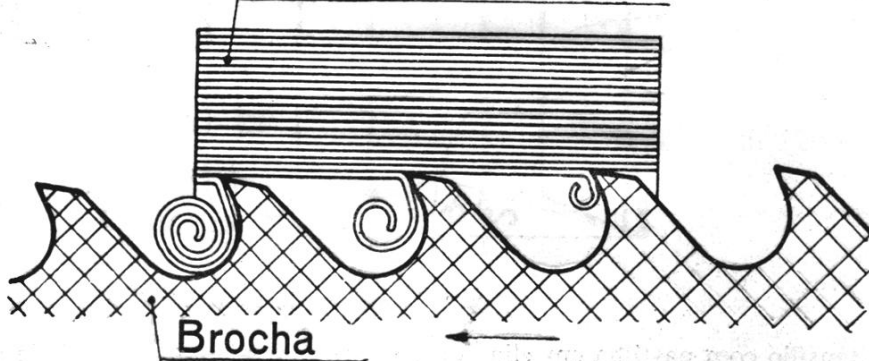


Fig.56- Brochamento externo



Elemento em usinagem



ROSCAMENTO

Fig. 57-Roscamento interno com ferramenta de perfil único

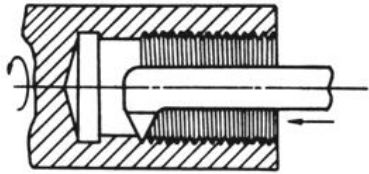


Fig.58-Roscamento interno com ferramenta de perfil múltiplo

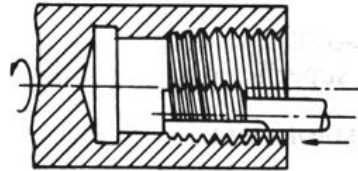


Fig. 59-Roscamento interno com macho

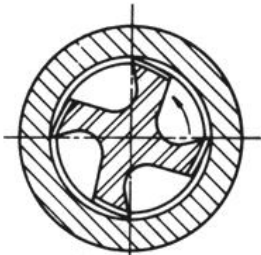


Fig.60-Roscamento interno com fresa

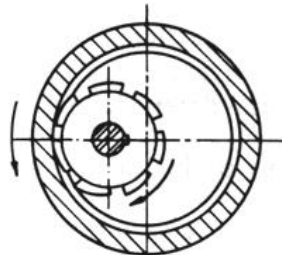


Fig.61-Roscamento externo com ferramenta de perfil único

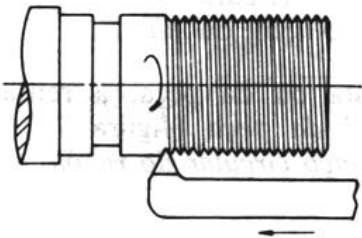


Fig.62-Roscamento externo com ferramenta de perfil múltiplo

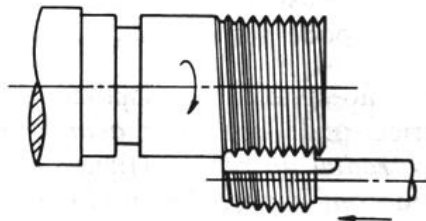


Fig.63-Roscamento externo com cossinete

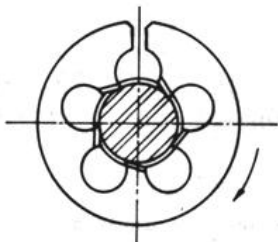
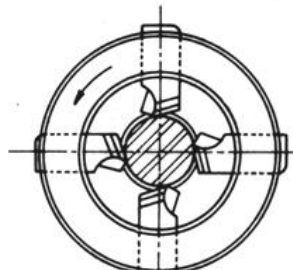
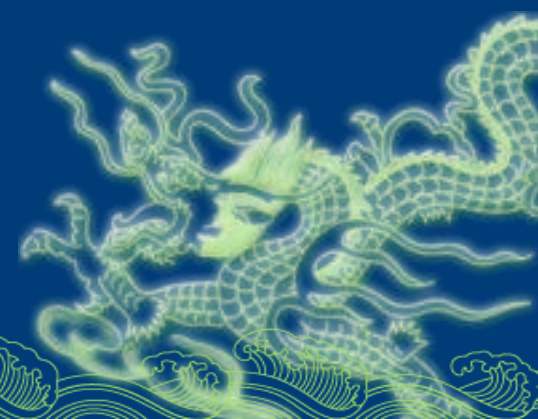


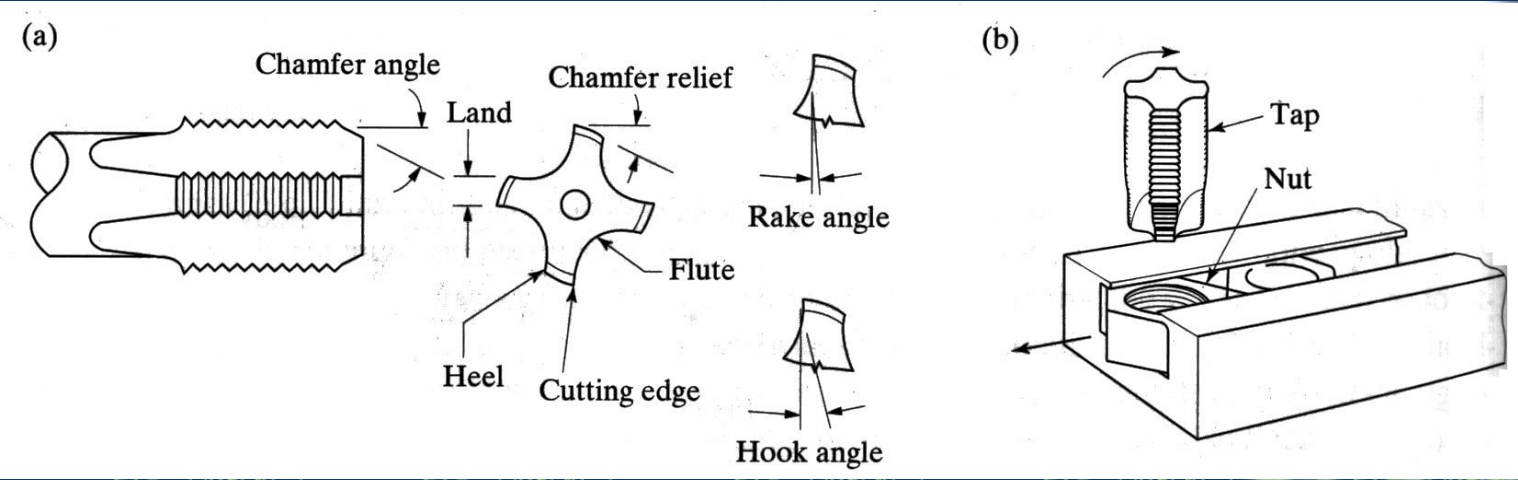
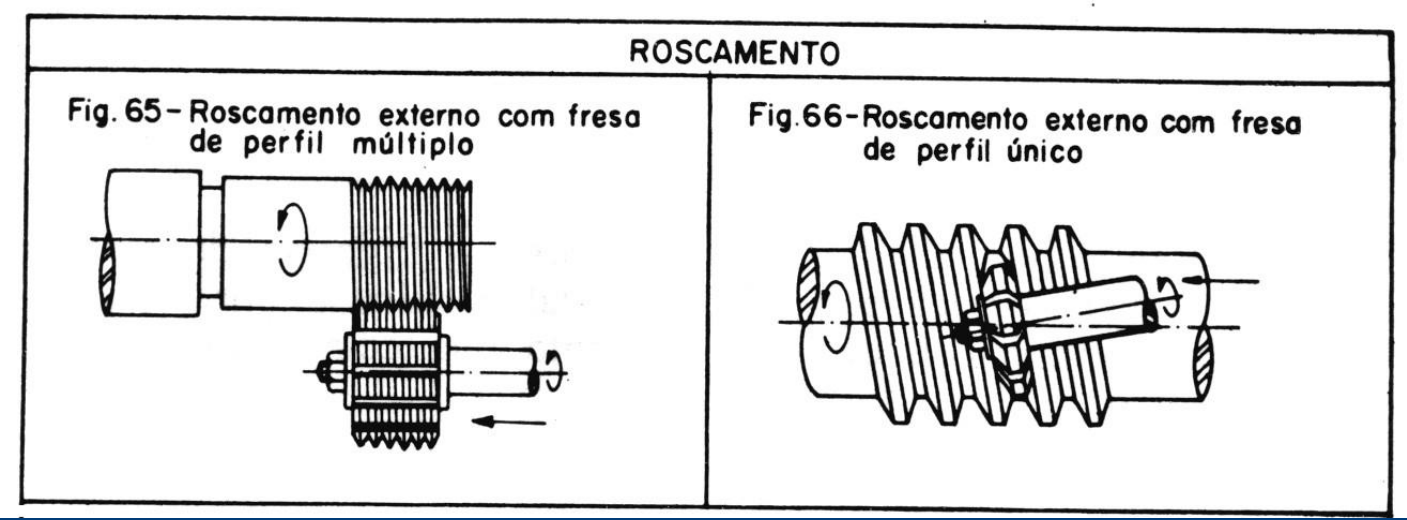
Fig.64-Roscamento externo com jogo de dentes



ROSCAMENTO



ROSCAMENTO



RETIFICAÇÃO

Fig.73-Retificação cilíndrica externa com avanço radial

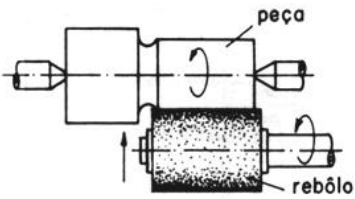


Fig.74-Retificação cilíndrica interna com avanço circular

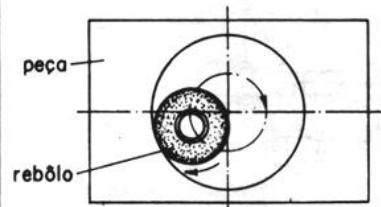


Fig.75-Retificação cônica externa com avanço longitudinal

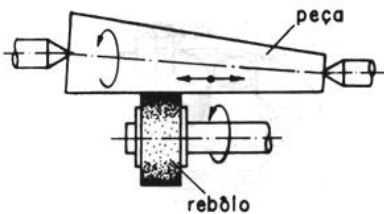


Fig.76-Retificação de perfil com avanço radial

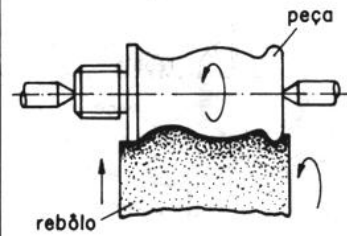


Fig.77-Retificação de perfil com avanço longitudinal

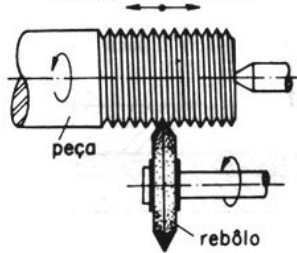


Fig.78-Retificação tangencial plana com mov. retilíneo da peça

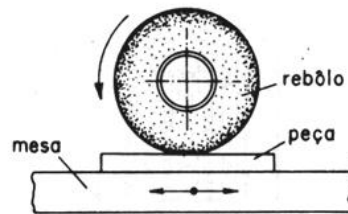


Fig.79-Retificação cilíndrica sem centros

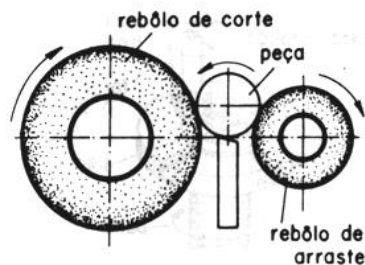
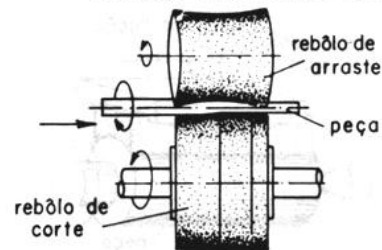


Fig.80-Retificação cilíndrica sem centros c/avanço long. contínuo da peça



RETIFICAÇÃO

RETIFICAÇÃO

Fig.71-Retificação cilíndrica externa com avanço longitudinal

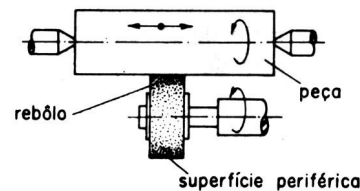
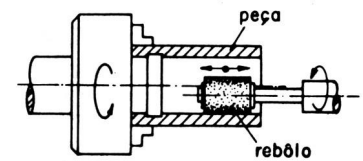
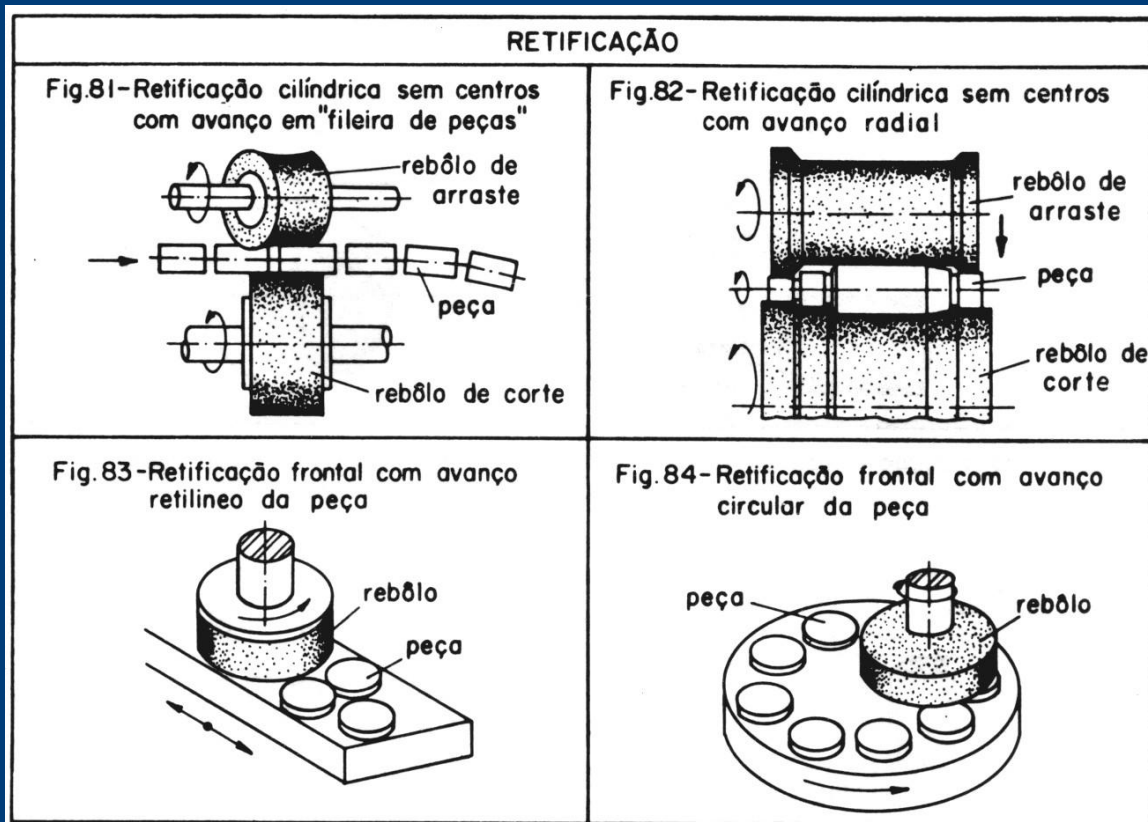
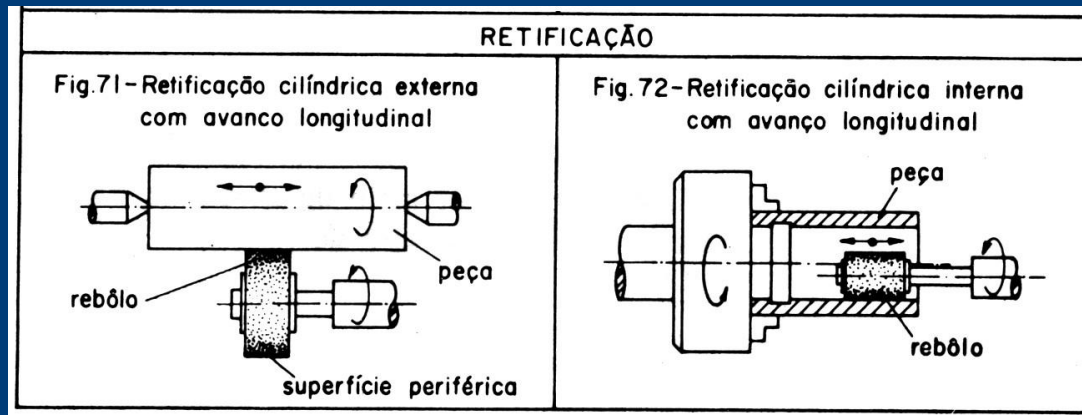
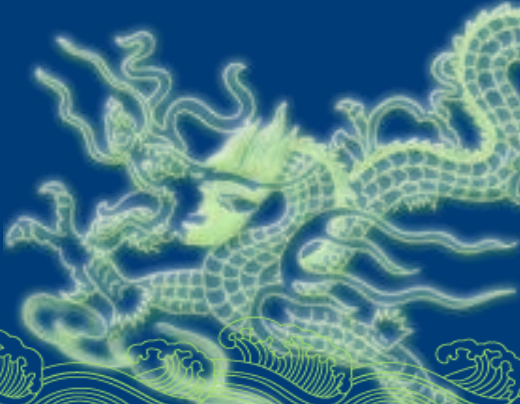


Fig.72-Retificação cilíndrica interna com avanço longitudinal





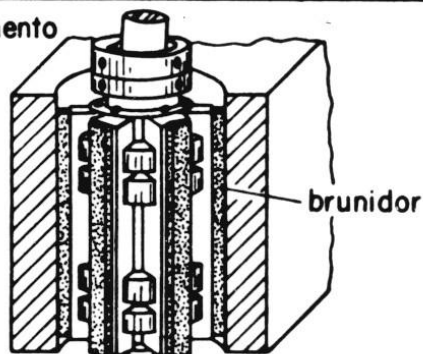
RETIFICAÇÃO



OUTROS PROCESSOS DE USINAGEM

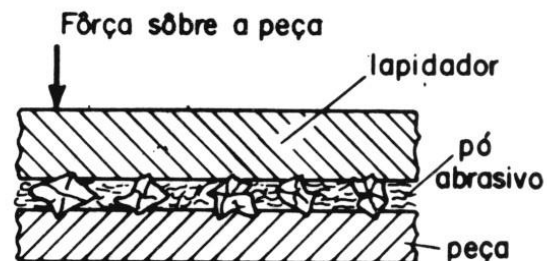
BRUNIMENTO

Fig.85-Brunimento



LAPIDAÇÃO

Fig.86-Lapidação



SUPER ACABAMENTO

Fig.87-Super-acabamento cilíndrico

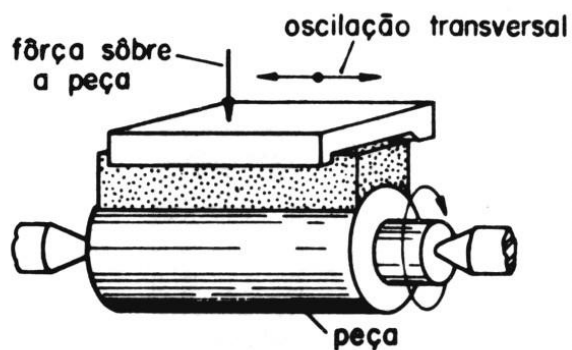
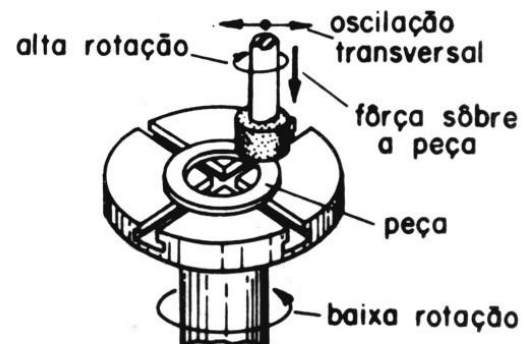


Fig.88-Super-acabamento plano



OUTROS PROCESSOS DE USINAGEM

POLIMENTO

Fig.89-Polimento

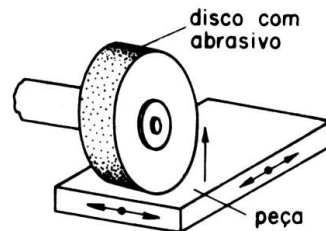


Fig.90-Polimento



LIXAMENTO

Fig.91-Lixamento com folhas abrasivas

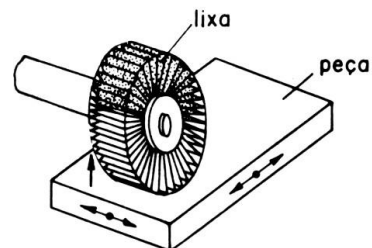
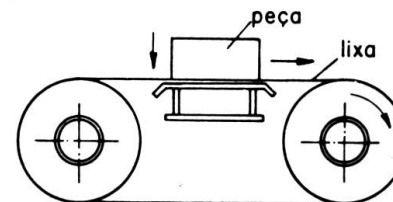
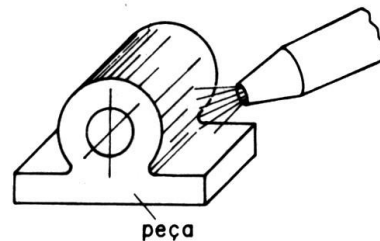


Fig.92-Lixamento com fita abrasiva



JATEAMENTO

Fig.93-Jateamento



AFIAÇÃO

Fig.94-Afiação

