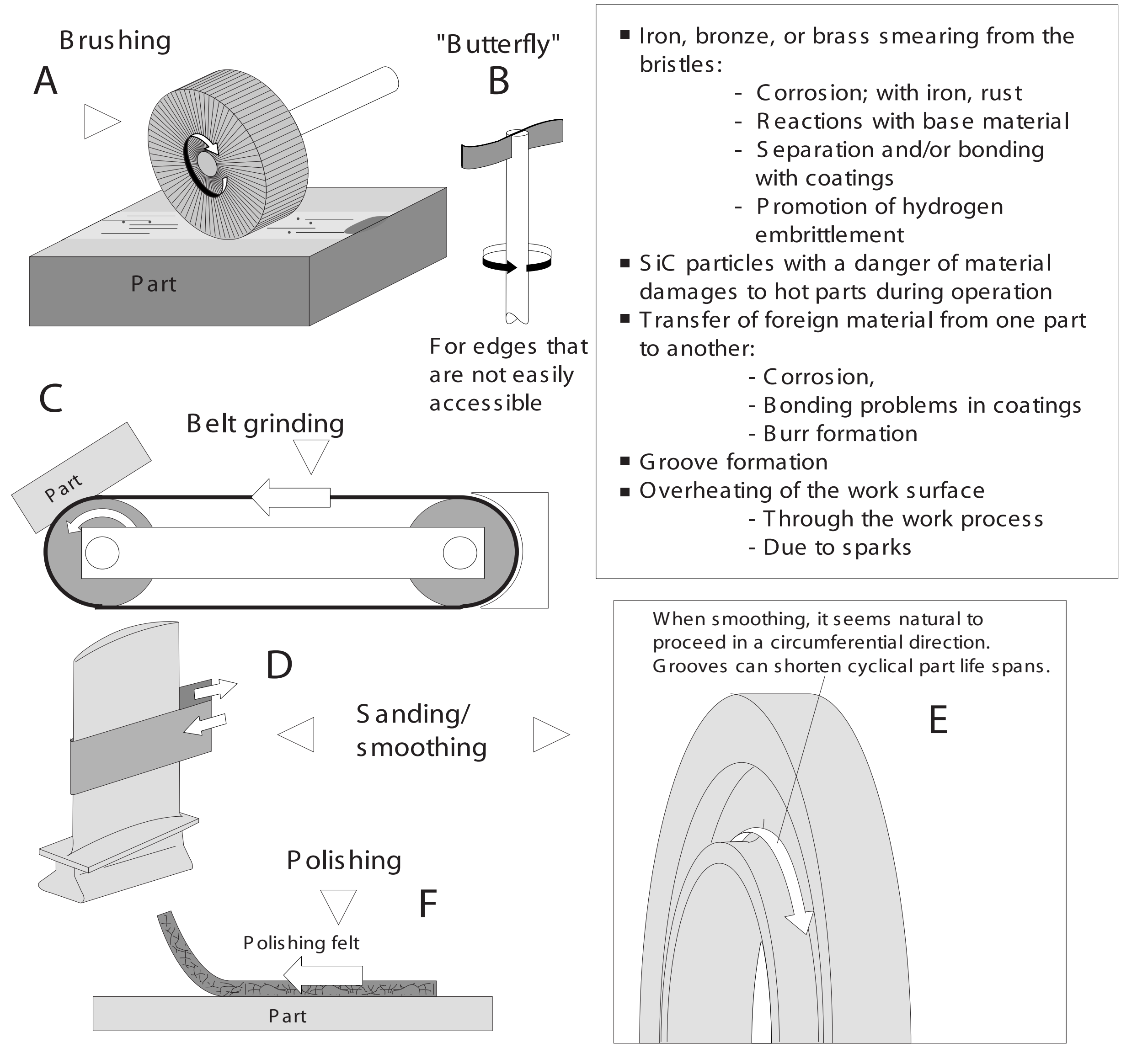
Possible problems with hand-guided precision work, deburring, and rounding using hard particles on a flexible carrier (emery cloth, abrasive paper):



Ill. 16.2.1.1-6

Illustration 16.2.1.1-6: Hand-guided deburring*, smoothing, and rounding using hard-particle coated, flexible, flat carriers and brushes with bristles made from materials such as steel or brass wire can be problematic (Ills. 16.2.2.3-11 and 16.2.2.3-13). There are more possibilities for these processes to damage the parts than are apparent at first glance:*

Smeared bristle material *("A"): there are many possible damage mechanisms, depending on the material of the part (Ills.16.2.2.3-1, 16.2.2.3-2, 16.2.2.3-11, and Ref. 16.2.1.1-18).* ***Steel brushes*** *made from carbon steel leave residue on* ***titanium disks****, for example, which can cause* ***corrosion*** *during later operation (Ref. 16.2.1.1-20). There is a special danger for surfaces with metallic smeared material on*

them that are subsequently ***heat-treated.*** *In Ni and Ti alloys, as well as steels,* ***liquid metal embrittlement cracking*** *may occur, depending on the material composition of the residue (Ill. 16.2.2.3-11).*
In titanium alloys, there is an increased danger of unallowable changes (strength, toughness) through ***hydrogen absorption in etching and cleaning baths*** *(Ill. 16.2.2.3-13).*
It has been observed that Fe fouling on the surface can promote cracking during ***the welding of Ti alloys*** *through the formation of brittle phases (Ill. 16.2.1.3-19). In addition, there is a potential danger that coatings may be influenced (e.g. diffusion coatings, lacquers, and galvanic coatings).*

Reactions with abrasive particles: *At high temperatures, such as those expected during heat treatment, welding, soldering, and diffusion coating,* ***SiC particles may react*** *with the base material, especially with* ***Ni and Ti alloys*** *(Volume 2, Ill. 7.1.4-14). Brittle phases form and melting occurs, causing dangerous strength losses. Therefore, it must be ensured that only* ***abrasive material with safe hard particles*** *such as* Al_2O_3 *(corundum) is used. This also applies to* ***polishing felt*** *("F").*

Transferral of wear products from other parts: *This risk occurs when* ***the same smoothing tool*** *(for example, "A", "B")* ***is used on parts made from different materials.*** *This can result in, for example, wear products from titanium alloys being transferred onto Ni alloys and vice versa. The dangers inherent in this are comparable with those of smeared materials discussed above (Ill. 16.2.2.3-1).*

Burrs: *burrs can considerably reduce the dynamic fatigue resistance (Chapter 16.2.2.2). Because abrasive processes are used especially to remove burrs, it must be ensured that they do not result in new burrs forming.*

Grooves: *these can promote dynamic fatigue cracking in highly-stressed part zones (Ills. 16.2.2.1-7 and 16.2.2.1-8). Unfortunately, the* ***accessibility determined by the shape of a part often provokes machining in a direction perpendicular to the main operating loads.*** *Typical examples include the rounding of edges on blades ("D") and the smoothing of transitional radii in disks ("E", Ill. 16.2.2.2-8).*

Overheating: *structural changes up to crack initiation can unallowably reduce part strength.* ***The danger of unnoticed overheating*** *through the machining process cannot be underestimated (Ill. 16.2.1.1-8.2).* ***Warning discolorations (tarnishing)*** *are the only external indicator of possible damage (Ill. 16.2.2.6-11) and can also be erased in the same machining process. This means that specialized* ***observation of the process by experienced experts*** *is especially important (Ill. 17-5).*
Another possibility for dangerous overheating is through the impact of sparks during an intensive smoothing process, for example, using a belt sander ("C"; Ill. 16.2.2.6-4).