Ashur university college prosthodontic Tech Dept crown and bridge lect 13 Spruing

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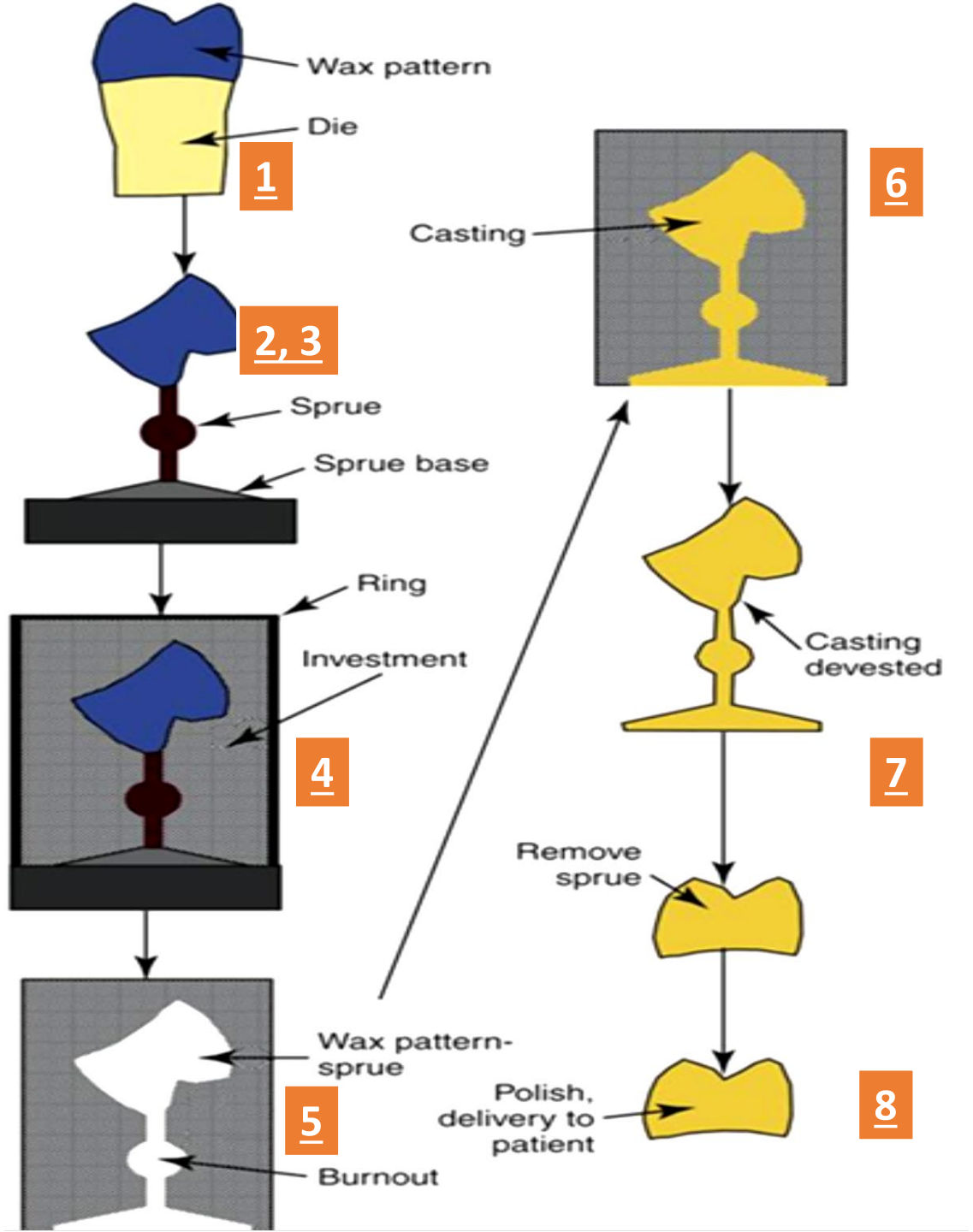
STEPS OF CASTING

1-preparing of the wax pattern
2- spruing the wax pattern
3-attaching the sprue to crucible former
4- investing the pattern in the casting ring
5- burnout of the wax
6- casting
7- recovery
8- finishing and polishing

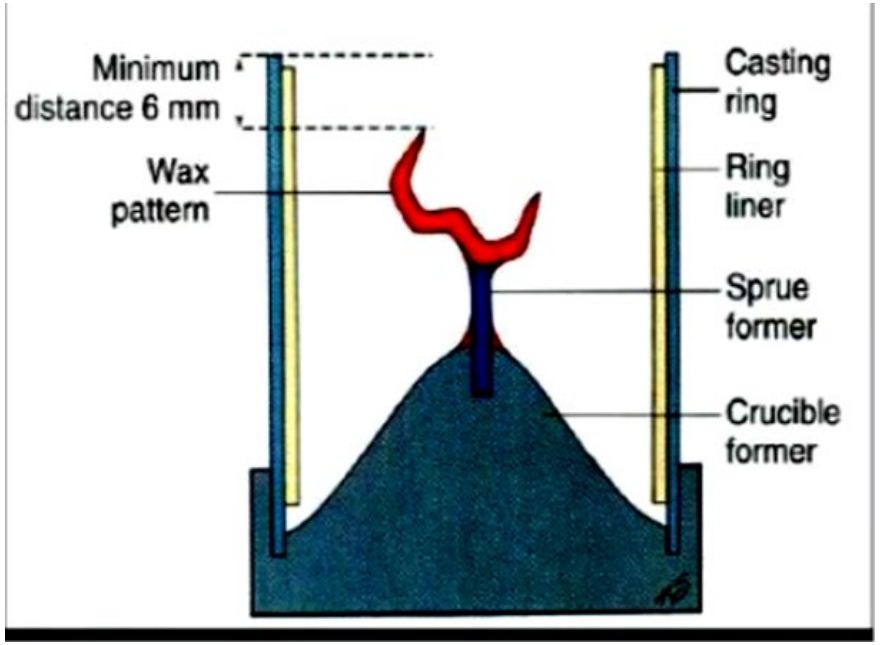


Spruing Procedure:

Spruing: Is a process of connecting the wax pattern with the crucible former in the casting ring with a pin made of wax, plastic or metal .

Sprue: It's a channel through which the molten alloy can reach the mold in an invested ring after the wax has been eliminated.

The opening into the mold equal sprue channel. The object forming the sprue channel is called sprue former or sprue pin.

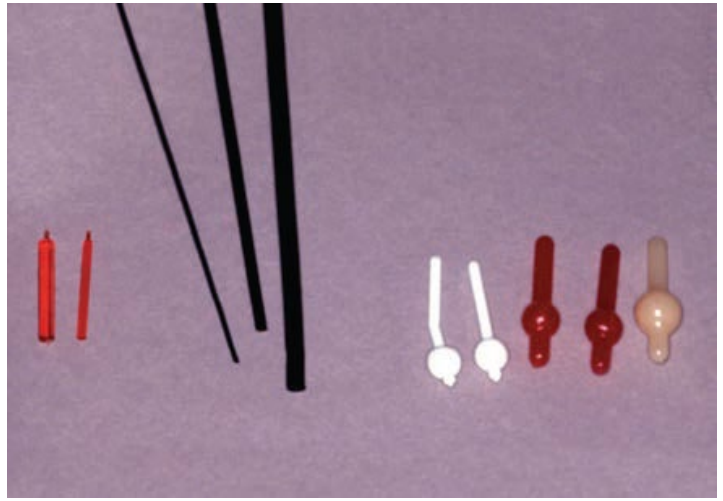


Sprue design varies depending on :

1. The type of restoration being cast.

2. The alloy used.

3. The casting machine.



Requirements of sprue:

1. The sprue must allow the molten wax to escape from the mold.

2. The sprue must enable the molten metal to flow into the mold.

3. The metal within it must remain molten slightly longer than the alloy that has filled the mold. This provides a reservoir to compensate for the shrinkage that occurs during solidification of the casting.

Reservoir: its wax added to the sprue pin (1-2mm) from the pattern, its (2-3mm) length, it should be larger than the thickness of cross section of the adjacent portion of the wax pattern, its purposes that to compensate the shrinkage that occurs during metal solidification.

Types of sprues:



1. The sprue can be wax, plastic, or metal. Wax sprues are preferred for most castings because they melt at the same rate as the pattern and thus allow easy escape of the molten wax.

2. Solid plastic sprues soften at a higher temperature than the wax pattern and may block the escape of wax, resulting in increased casting roughness.

3.Hollow plastic sprues are available that permit the escape of wax.

4. Metal sprue is also available; it should be made of non rusting metal to avoid possible contamination of the wax. Metal sprues are often hollow to increase contact surface area and strengthen the attachment between the sprue and pattern. They are usually removed from the investment at the same time as the crucible former. Special care must be taken to examine the orifice for small particles of investment that may break off when such a sprue is removed because these can cause an incomplete casting if undetected.

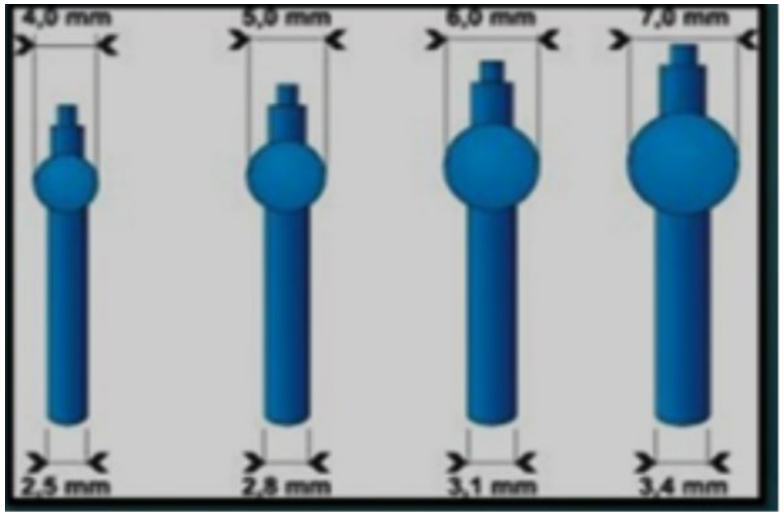
Types of sprue

1- wax , 2- plastic , 3- metal

Wax sprue is preferred for most casting because they melt at the same rate as the pattern and allow easy escape of the molten wax.

Diameter of sprue:

In general, a relatively large-diameters sprue is recommended because this improves the flow of molten metal into the mold and ensures reservoir during solidification. A 2.5-mm (10-gauge) sprue is recommended for molar and metal ceramic patterns. A smaller 2.0-mm (12-gauge) is adequate for premolars and partial coverage restorations.



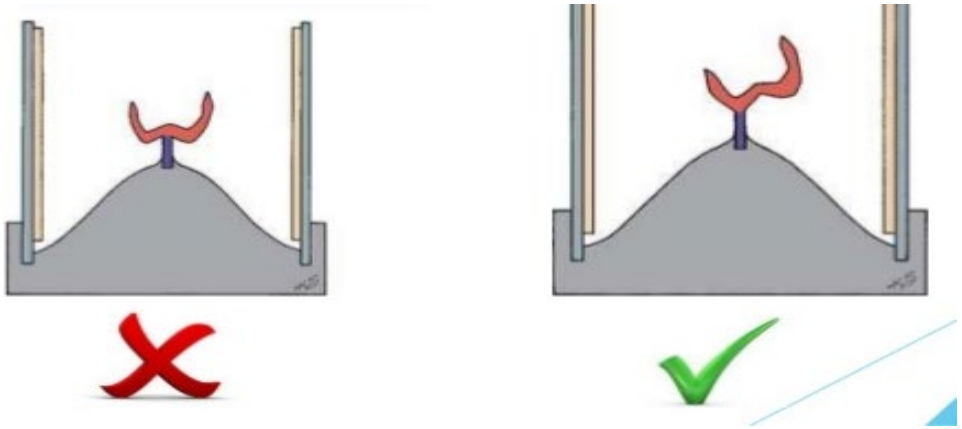
Location of sprue:

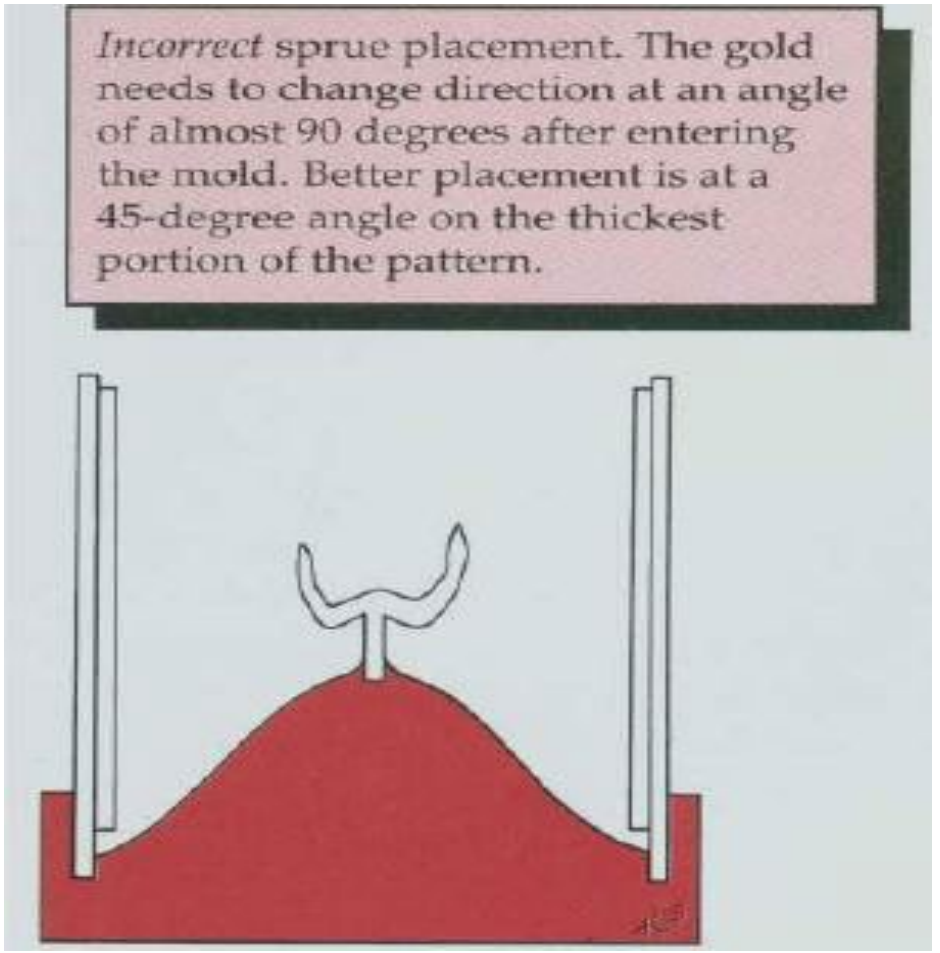
1. The sprue should be attached to the bulkiest part of the pattern, away from margins and occlusal contacts. Normally the largest non centric cusp is used.

2. The point of attachment should permit a stream of metal to be directed to all parts of the mold without having to flow opposite the direction of the casting force.

3. The sprue must also allow for proper positioning of the pattern in the ring. This can be critical because expansion within the mold is not uniform. For example, Spruing on the cusp tip can give good results, but spruing on the proximal contact may produce a casting that is too wide mesiodistally and too short occlusocervically

Correct sprue placement on the bulkiest nonfunctional cusp allows molten alloy to flow to all parts of the mold.



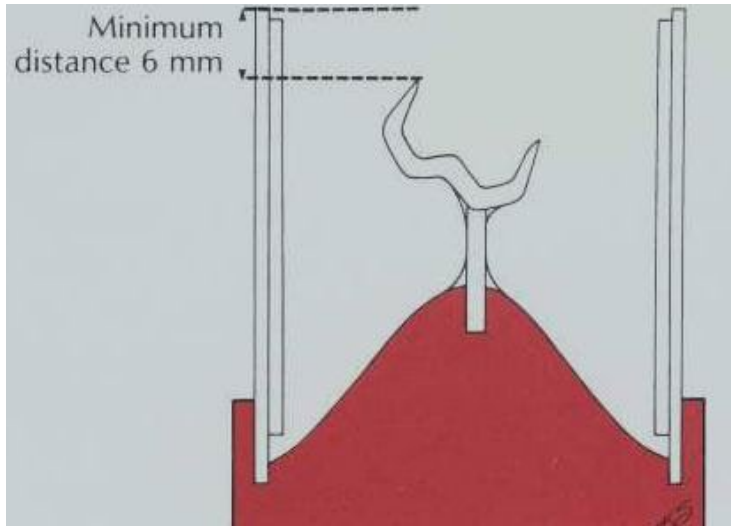


Attachment of sprue:

The sprue's point of attachment to the pattern should be carefully smoothed to minimize turbulence. The attachment area should not be restricted because necking increases casting porosity and reduces mold filling.

Length of sprue:

The length of sprue former should be just long enough, so that the highest point on the pattern will be 6mm from the end of the ring .If the pattern is too close to the end of the ring the molten alloy may blast through the investment during casting, if it's too far, gases may not escape rapidly enough to permit complete filling of the mold with alloy. The length of sprue former is 6mm (between the pattern and crucible former) depending on the height of the crucible former.



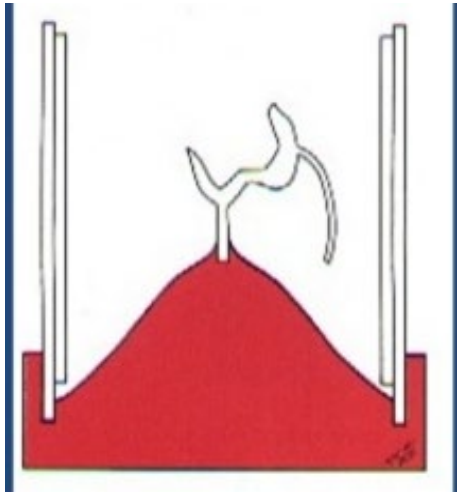
Crucible Former

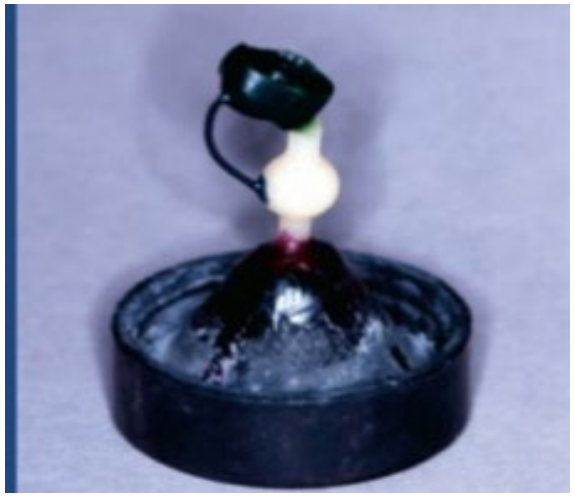
The sprue is attached to a crucible former, usually made of rubber, which constitutes the base of the casting ring during investing. The exact shape of the crucible former depends on the type of casting machine used. With most modern machines, the crucible former is tall to allow use of a short sprue and allow the pattern to be positioned near the end of the casting ring.



Venting

Small auxiliary sprue or vents have been recommended to improve casting of thin patterns and may help in gases escape during casting. Compensate for shrinkage during solidification.





Four factors affect the rate of gas escape :

1- Permeability of refractory materials.

2- The thickness of the material between the top of pattern and the top of casting ring.

3- The height of sprue orifice of hole.

4- The presence of air vent around the mold.

Spruing method:

1-Direct method: usually used with small or moderate size casting it connects wax pattern directly to the crucible former ex. melts or molten metal came directly to the mold cavity.

2-Indirect method: used with multiple casting or unite like bridge, the metal reach the mold cavity by indirect branch channels(runner bar).

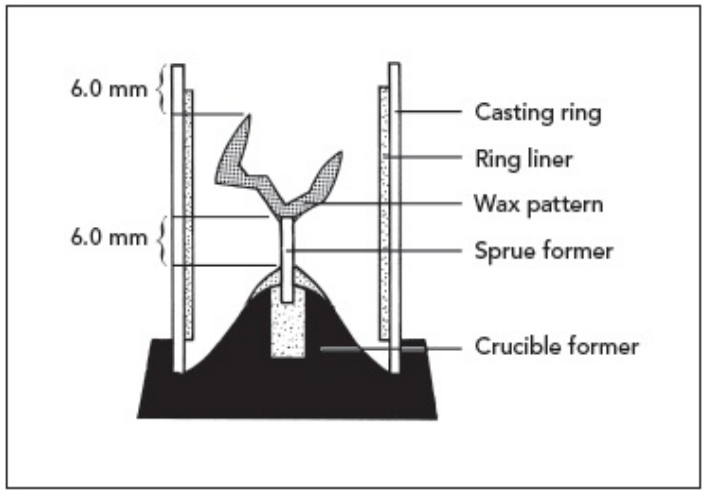


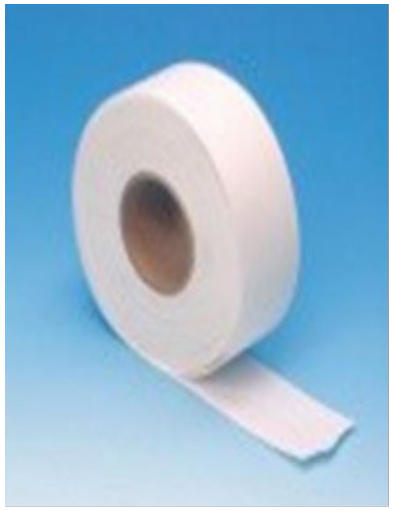
Casting Ring and Liner:

The casting ring holds the investment in place during setting and restricts the expansion of the mold. Normally a liner is placed inside the ring to allow for more expansion. At one time asbestos was used as the liner, but this has been replaced by other materials to avoid the health risks associated with asbestos fibers. cellulose paper liners or refractory ceramic fiber liners are now used.

The function of liner a- prevent loss of heat during transfering ring from burnout furnace to casting machine , b- allow mold expansion towards periphery of the ring , c- help in recovery of the cast.







Ringless Investment Technique

With the use of higher-strength, phosphate-bonded investments, the ring less technique has become quite popular. The method uses a paper or plastic casting ring and is designed to allow unrestricted expansion .



Crucible formers and cone-shaped plastic rings for a ringless investment technique in casting. The crucible former and plastic ring are removed before wax elimination, which leaves the invested wax pattern. The systems are designed to achieve expansion that is unrestricted by a metal ring.

Sprue technique

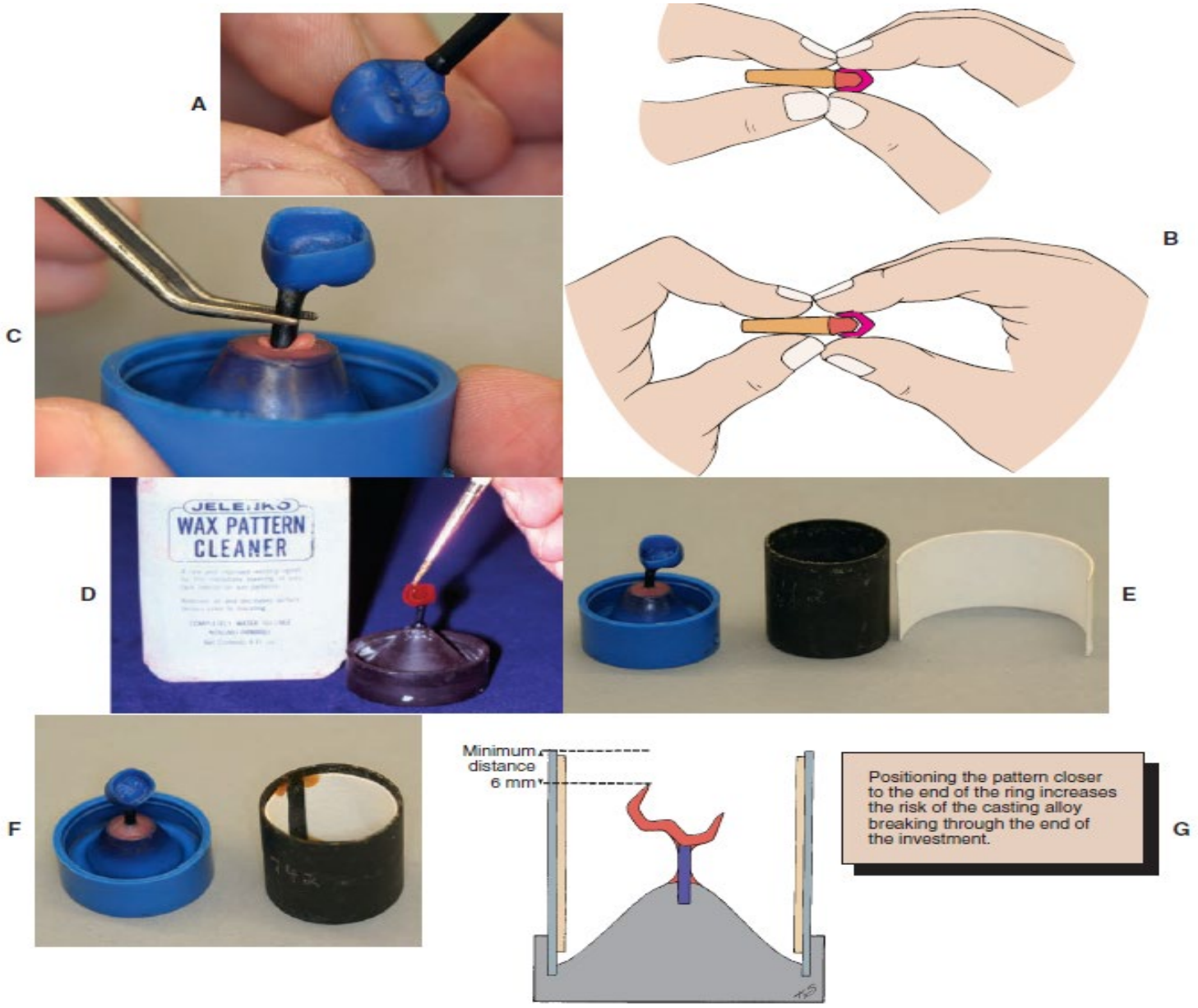


FIGURE 22-10 ■ Sprue technique for a single casting. **A,** Attaching the sprue to the pattern. **B,** Removing the pattern from the die. **C,** Positioning the pattern on the crucible former. **D,** Application of surfactant. **E,** A ring liner increases the setting expansion. **F,** The ring liner has been stabilized with sticky wax. **G,** The pattern must be positioned a sufficient distance from the end of the ring.