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**METHODS OF WORKING CASTS  
AND DIE SYSTEMS PRODUCTION**

Minsk BSMU 2020

МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ  
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**МЕТОДЫ ИЗГОТОВЛЕНИЯ  
ГИПСОВЫХ МОДЕЛЕЙ**

**METHODS OF WORKING CASTS  
AND DIE SYSTEMS PRODUCTION**

Учебно-методическое пособие



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П52

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Содержит данные о методах изготовления гипсовых моделей, а также о последовательности изготовления цельных (неразборных) и разборных гипсовых моделей.

Предназначено для студентов 1–5-го курсов медицинского факультета иностранных учащихся, обучающихся на английском языке.

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## INTRODUCTION

The production of dentures in the dental laboratory primarily involves the presence of a replica of teeth and the associated supporting bony tissue of a jaw — cast, model (fr. *modèle* — analogue, sample). Model is prepared from an impression (negative replica of teeth and the associated supporting bony tissue of a jaw) using a special cast and model materials (calcium sulfate hemihydrate, phosphate refractory materials, epoxy resins, polyurethane, etc.). Cast production is the main step in the dental laboratory, which determines the quality of all following work.

There are many methods available for making casts in modern dentistry. The choice of the method is determined by the purpose of the cast and the final purpose of its application. There are working, auxiliary and diagnostic casts from gypsum material. The definitive cast (or master or working cast) is the positive replica of teeth and the associated supporting bony tissue of a jaw, which are intended for the manufacture of dentures. The auxiliary cast is the replica of the opposite teeth row (casts of teeth-antagonists). The diagnostic cast is used for the purpose of study, treatment planning and registration of clinical picture of disease before, during and after the treatment.

There are complete casts and die systems in accordance with the type of denture produced on the working cast (fig. 1).

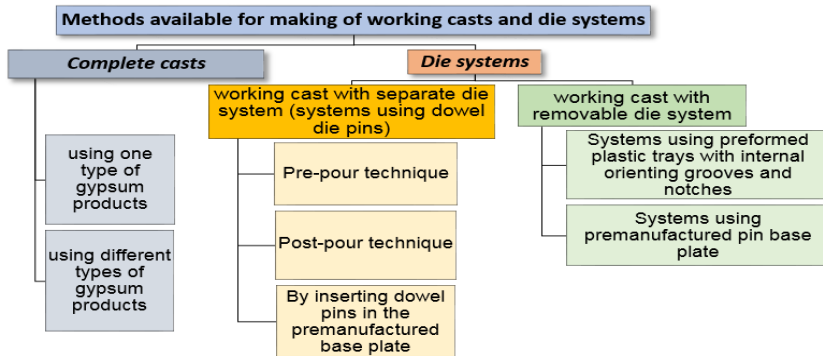


Fig. 1. Methods available for making of working casts and die systems

Complete casts can be made using one type or two different types of gypsum products.

## METHODS OF COMPLETE CAST PRODUCTION

### Method of complete cast production using one type of gypsum products

The sequence of complete cast production using one type of gypsum products is shown in fig. 2 and includes the following steps:

1. Preparation of impression (fig. 2, *a*)
2. Water/powder ratio, mixing/spatulation of gypsum, pouring of impression and base formation using base former (fig. 2, *b*)
3. Inversion of impression onto the base (fig. 2, *c*)
4. Separation of impression from the cast and separation of cast's base from base former (fig. 2, *d*)
5. Trimming the cast (fig. 2, *e*)

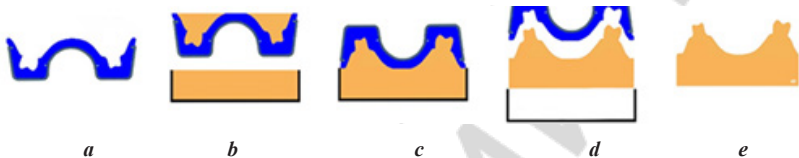


Fig. 2. The sequence of complete cast production using of one type of gypsum products (the description in the text)

In accordance with the used impression material, impressions should be poured in different time period. Set alginates have poor dimensional stability due to evaporation, syneresis and imbibition, therefore cast should be poured immediately or within 20 minutes after removing the impression from oral cavity. Silicones and polyether impressions should be poured no earlier than 1–3 hours after removing the impression from mouth. The mentioned period of time provides full polymerization of materials and promotes their maximum restoration of the initial sizes after deformation (recovery).

The impressions are rinsed under tap water at room temperature. To eliminate traces of alginic acid, which prevents the reaction of gypsum setting, alginate impressions are recommended to be rinsed with a solution of potassium alum.

For disinfection, the impression is immersed in a bath with a disinfectant. Spraying disinfectant is also used for disinfection, after this the impression should be saved in a special package. The exposure time is determined by the instruction for the disinfectant. After disinfection the impressions are rinsed under tap water at room temperature one more time. Before pouring, silicone impression is recommended to be sprayed to relieve stress and improve wettability.

The water/powder ratio varies for the particular brand of gypsum. The water and powder should be measured by using an accurate graduated cylinder for the water volume and a weighing balance for the powder.

Mixing the material should be either by hands, or by mixing under vacuum. Rubber bowls (fig. 3, *a*) and spatulas (fig. 3, *b*) are used in hand mixing.

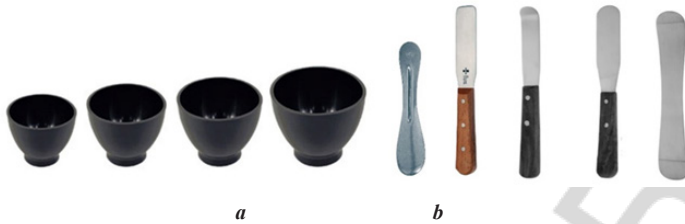


Fig. 3. Rubber bowls (*a*) and spatulas (*b*) in gypsum hand mixing.

The measured water is added to a rubber bowl first, followed by gradual addition of preweighed powder (fig. 4, *a*), and after it is mixed with spatula until a smooth homogenous mix is obtained (fig. 4, *b*).

Gypsum products can also be mechanically spatulated (mixed) using a motor-driven bowl and spatula. Some of the motor-driven spatulas also allow a vacuum hose to be attached so that trapping air in the mix will be minimized. Motor-driven mixing is preferable, because it provides for a faster-setting gypsum product with slightly better physical properties and fewer air bubbles. A minimum of air inclusion in the mixed product is desirable to prevent surface bubbles and internal defects. Furthermore, the components should be thoroughly mixed until a creamy homogeneous structure is achieved. Considerable quantities of air may be incorporated during hand mixing and this may lead to porosity within the set material. Air porosity may be reduced by vacuum mixer (fig. 5, *a*).

First, the gypsum is manually mixed with a spatula in a mixing bowl after adding the powder to the water (fig. 5, *b*). Then the mixing bowl is attached to the vacuum mixer and the gypsum is mixed for 60–80 seconds at 350 rotations per minute and under pressure not lower than 0.8 bar.

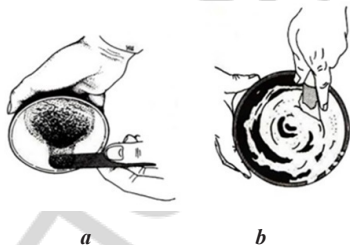


Fig. 4. Adding powder to water in a flexible rubber bowl (*a*) and mixing with spatula (*b*)



Fig. 5. Vacuum mixer (*a*) and mixing bowls (*b*) for gypsum products

Plaster vibration machine (vibrator) is used to move gypsum products when pouring a cast (fig. 6, *a*). Vibrator increases density of mix by eliminating air bubbles. Control knob is used to adjust intensity of vibration. Impression is placed on flat-top working surface of vibrator as gypsum material is poured into it (fig. 6, *b*).

After covering all the critical surfaces of the impression with first pour, the gypsum material is placed to a level slightly above the height of the impression walls. With a second mix of gypsum material, a patty for the base is formed with spatula on the flat surface of the gypsum table and the first pour is inverted into the patty. The height of the base should be about 15–20 mm and the bottom of the tray should be parallel to the surface of the table. The spatula is used for removing excess material and shaping of the cast. The angle of the faces of the base with the surface of the table should be 90°.

It must be recognized, that using the rubber mould base former is the most rational method of cast base formation (fig. 7, *a*). The base former is filled with gypsum product and the first pour is inverted into the base. The rubber mould base former provides formation of a cast base within established thickness and faceting (fig. 7, *b*). Further processing of the cast base is not required.

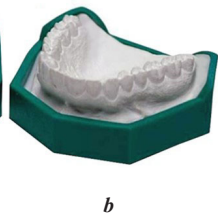
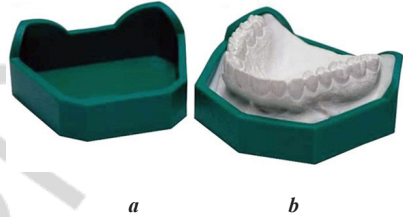


Fig. 6. Plaster Vibration Machine (*a*) and pouring of impression on flat-top working surface of vibrator (*b*)

Fig. 7. Rubber mould base former (*a*) and gypsum cast after separation from the impression (*b*)



Fig. 8. Gypsum knives

After the final setting reaction any gypsum product from the outside of the tray is trimmed with instruments (a gypsum knife, a spatula for gypsum products mixing, etc.). Then the tray is removed and the cast is separated from the impression.

The cast base mechanical grinding is carried out by gypsum knives (fig. 8).

Trimming the cast is started by grinding the cast base parallel to the occlusal plane of the teeth. The base should be about 15–20 mm thick. Fig. 9 shows the desired cast dimensions of a trimmed cast. The formation of the vestibular surface of the base in the form of a sphere is allowed.

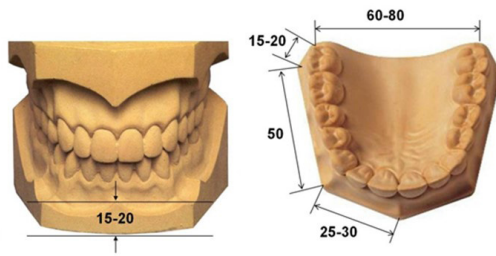


Fig. 9. The desired cast dimensions of a trimmed cast (in mm)

Dental model trimmers are necessary in a dental laboratory for trimming gypsum casts (fig. 10, *a*). Trimmer is electrically operated machine that has partially diamond-coated trimming disc (fig. 10, *b*), fully diamond-coated trimming disc (fig. 10, *c*) or carborundum trimming disc (fig. 10, *d*).

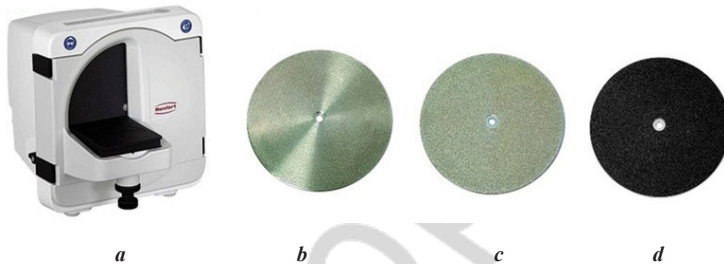


Fig. 10. Dental model trimmer (*a*), partially diamond-coated trimming disc (*b*), fully diamond-coated trimming disc (*c*) and carborundum trimming disc (*d*)

The cast is installed on the trimmer working table, angulation of the last one to the abrasive disc is adjusted. The cast is introduced into contact with the rotating disk and it is trimmed at a speed of rotation of the disk 2800–3400 rpm. There are dry trimming (without water delivery) and wet trimming (disc rotates while water flows onto it under the pressure of 1–5 bar). The partially diamond-coated trimming disc is suitable for dry trimming. All types of discs are suitable for wet trimming.

#### Method of complete cast production using of two types of gypsum products

Complete casts can be made using two different types of gypsum products (fig. 11). In this case working casts have two parts: the anatomic portion, which replicates the hard and soft structures (made from type III or type IV of gypsum



products), and base (made from type II of gypsum products). The name of this cast is complete cast made by double-layered technique using of two types of gypsum products.

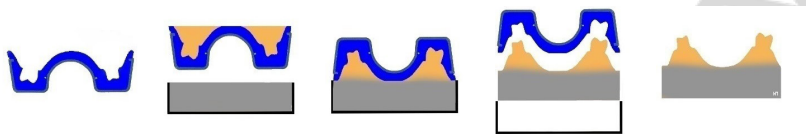


Fig. 11. The sequence of complete cast production using of two types of gypsum products (the description in the text)

## METHODS OF WORKING CAST PRODUCTION WITH SEPARATE DIE SYSTEM

### Method of working cast production with separate die system (pre-pour technique)

In the production of fixed dentures there is a need to remove die sections and replace them accurately in the original position, which means to use a working cast with separate die system.

Dowel pins are used in production of working cast with separate die system. Dowel pins can be made of brass, nickel-plated steel, plastic or nickel-plated zinc. Pins usually have the shape of a truncated cone. Taper is necessary for better separation of the dowel pin from the cast base. The cross-section of the dowel pins can be of different shapes (fig. 12). The shape of the cross-section is selected so that the pin is precisely fixed in an initial position and does not rotate around its own axis. For this purpose, one guide (fig. 12, *a*) or two guides (fig. 12, *b*) are created on its surface. The asymmetrical shape of the dowel pin (fig. 12, *c*, *d*) also excludes its rotation and the possibility of inserting the pin in the wrong position. Antirotational stability of the dowel pin is encouraged by pins with two guides (fig. 12, *e*). Round dowel pins (fig.12, *f*) are used only when they are paired in the area of one tooth.

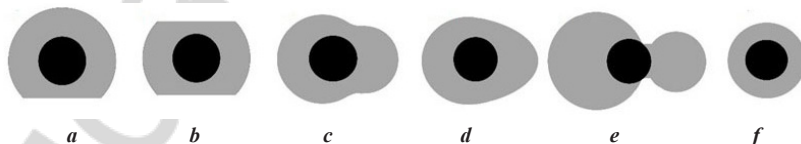


Fig. 12. The cross-sectional shape of the dowel pins:

*a*— round with one guide; *b*— round with two guides; *c*— flattened with longitudinal grooves on the lateral surfaces; *d*— ovoid; *e*— with two guides; *f*— round

Fig. 13 shows varieties of dowel pins used for the production of working cast with separate die system. Plastic or metal sleeves (fig. 13, *b, f, g, h*) provide the stability of the dowel pins inside the cast base. There are notches for better retention on part of dowel pin that are inserted into die. Dowel pins with spike (fig. 13, *d, h, j*) and dowel pins with fixing wire (fig. 13, *e, i*) are manufactured for insertion in the cast.



Fig. 13. Dowel pins that are used in casts to remove die sections:

*a* — nickel-plated straight dowel pin; *b* — nickel-plated straight dowel pin with plastic sleeve; *c* — brass straight dowel pin; *d* — brass straight dowel pin with spike; *e* — brass straight dowel pin with fixing wire; *f* — nickel-plated double straight dowel pin with common head (Bi-Pin) and metal sleeve; *g* — nickel-plated double straight dowel pin with common head (Bi-Pin) and plastic sleeve; *h* — nickel-plated double straight dowel pin with common head (Bi-Pin), spike and metal sleeve; *i* — nickel-plated double straight dowel pin with fixing wire (BI-FIX); *j* — plastic oval dowel pin with spike; *k* — plastic flattened dowel pin with longitudinal grooves on lateral surfaces; *l* — brass rounded straight dowel pin

For the production of working cast with separate die system, dowel pin is positioned over each prepared tooth in the impression before it is poured. Accurate positioning of the dowel pins in the impression is important for easy separation of the die from the cast base and for maintaining of the strength of the die. If the dowel pins are positioned inaccurately, they can be displaced in vestibulo-oral and mesio-distal direction or can be easily removed from the cast. Bobby pins can be used for exact positioning of the dowel pin. The dowel pin is placed between the arms of a bobby pin. Dowel pin should be placed parallel to the long axis of the prepared tooth without inclination and connection with impression. Bobby pin is stabilized with sticky wax (fig. 14, *a*). Dowel pins with spike are established into the impression before it is poured (fig. 14, *b*). The spike is trimmed to the level of occlusal surface of the die after separation of impression from the cast. Dowel pin with fixing wire is attached to the edge of the impression (fig. 14, *c*).

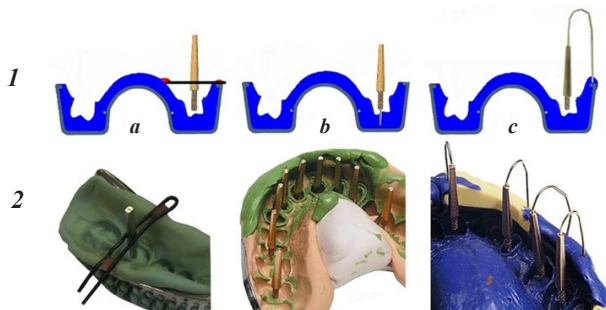


Fig. 14. Scheme of dowel pin positioning (1) and examples of the use of elements for positioning (2) of straight dowel pin (a), dowel pin with spike (b) and dowel pin with fixing wire (c)

Fig. 15 shows the sequence of production of working cast with separate die system (pre-pour technique). The impression (fig. 15, a) should be disinfected. After disinfection the impressions are rinsed under tap water during 15 seconds. Dowel pin is positioned over each prepared tooth. After fixation of dowel pins, type IV of gypsum material is prepared and is poured the impression to a level on 5–7 mm above the level of teeth cervix. Retention rings are placed in cast base in the places free from dowel pins (fig. 15, b). The base is formed by type III of gypsum products and the first pour is inverted into this base (fig. 15, c). After complete setting of the gypsum material, the cast is separated from the impression and is trimmed by dental model trimmer (fig. 15, d). Sawing casts and dies is one of the most important step during production of working cast with separate die system. First, the line of the sawing is signed by pencil. Then the sawing through the cast till base is made. The cuts should be parallel to each other to provide easily dies separation from the cast base (fig. 15, e).

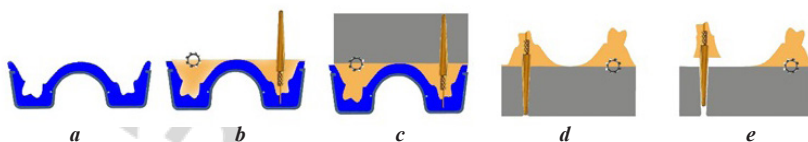


Fig. 15. The sequence of working cast production with separate die system (pre-pour technique) (the description in the text)

The saw frame with a thin blade is used for sawing casts and dies in the dental laboratory (fig. 16, a). This tool consists of the grip frame and clamps for the blade fixation. The blade has the thickness from 0,12 to 0,25 mm, the height from 3,0 to 5,0 mm, the length is determined by the design of the tool and the method of fixing

the blade in the frame. Separating diamond discs is used for sawing casts and dies as well (fig. 16, *b*). The diameter of the disc is between 25 and 45 mm and the thickness is 0,3 mm. Special devices for sawing casts and dies are convenient and safe in work (fig. 16, *c*).



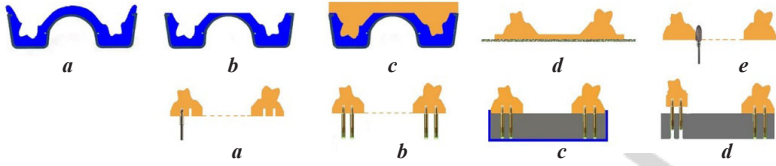
*Fig. 16.* Tools and equipment used for sawing casts and dies: saw frame with a thin blade (*a*), separating diamond discs (*b*) and special devices for sawing casts and dies (*c*)

The die is separated from the model after sawing by tapping the grip frame on the top of the dowel pin. The procedure is repeated for each die on the cast.

### **Method of working cast production with separate die system (post-pour technique)**

Dowel dies can be attached to the underside of the cast that has already been poured. The name of this method is Pindex system. The sequence of working cast production with separate die system (post-pour technique) is shown in fig. 17 and includes the following steps:

1. Trimming of impression (fig. 17, *a, b*).
2. Water/powder ratio, mixing/spatulation of gypsum and pouring of impression (fig. 17, *c*).
3. Separation of the cast from the impression and trimming the cast (fig. 17, *d*).
4. Trimming the periphery of the cast in the palate/tongue area (fig. 17, *e*).
5. Drilling to fabricate precise parallel drill channels (fig. 17, *f*).
6. Cementing the dowel pins (fig. 17, *g*).
7. The base formation (fig. 17, *h*).
8. Sawing casts and dies (fig. 17, *i*).



*Fig. 17.* The sequence of working cast production with separate die system (post-pour technique) (the description in the text)

Vestibular part and palate area is trimmed in the upper jaw impression. Vestibular part and tongue area is trimmed in the lower jaw impression. Teeth and alveolar bone is poured by type IV of gypsum products and then the material is placed 20 mm above the height of the impression walls.

After the final setting reaction of gypsum material, the cast is separated from the impression and trimmed with model trimmer. Trimming is started from the cast base (fig. 18). It should be perfectly flat and its thickness must be a minimum of 15 mm.

Any excess of gypsum material on the vestibular and lingual (palatal) surface is trimmed with a plaster milling cutter (fig. 19, *a, b*).



*Fig. 18.* The cast base is trimmed on the model trimmer



*a*



*b*

*Fig. 19.* Plaster milling cutter (*a*) and the process of trimming the cast (*b*)

The working cast should be in the shape of a horseshoe and the vestibulo-lingual width should be approximately 20 mm (fig. 20).

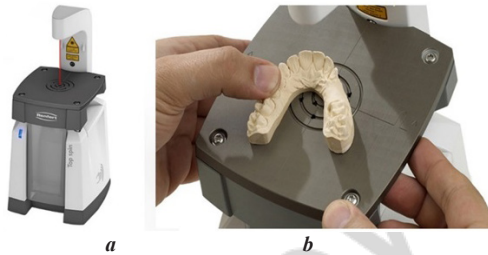


*Fig. 20.* The casts prepared for the installation of the dowel pins (Pindex system)

Location of the pin holes in the occlusal surface of cast is marked with a pencil. Dowel pins should be positioned on all crowns, supporting teeth of bridge

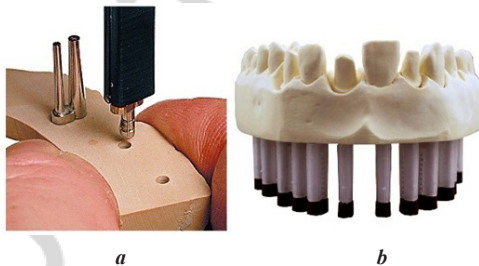
and adjacent teeth. In addition, at least two dowel pins should be installed in the remaining part of the cast. Two dowel pins or one dowel pin with two guides for each die is positioned. The saw cuts should be pre-marked, they should be parallel, which in the future will ensure the easy separation of dies.

A special drilling unit is used in the dental labs to fabricate precise parallel drill channels (Pindex system) (fig. 21, *a*). The prepared cast is placed on the worktable and the first pencil mark is aligned with the illuminated dot from the light beam director (fig. 21, *b*). Using both hands, firm downwards pressure is exerted on the cast with thumbs. The handle bar with slow pressure is raised and the drill assembly moves upwards cutting the pinholes till proper depth and diameter is achieved.



*Fig. 21.* Drilling unit used in the dental labs to fabricate precise parallel drill channels (Pindex system) (*a*) and the prepared cast placed on the worktable (*b*)

Compressed air and brush is used to remove debris from holes. The pin holes are refined with hand reamer. Cyanoacrylate cement or cement based on ethanol is placed on the dowel pins prior to cementing the pin tips (fig. 22). The bottom of the cast is lightly coated with the petrolatum or another isolating material.



*Fig. 22.* Dowel pins cemented with cyanoacrylate cement (*a*) and the cast ready for base formation (*b*)

Using the rubber mould base former is the most rational method of cast base formation (fig. 23, *a*). The depth of the base former should match the length of

the dowel pins. The base former is filled with type III gypsum product and the part with dowel pins is inverted into the base till the contact between the tops of the dowel pins and the base of the former (fig. 23, *b*). Excess gypsum material is removed.

When the cast become hard, the base former is removed. The cast is trimmed before the appearance of line between the base and the part with dowel pins. This two parts can be separated from each other in one block (fig. 24), that will allow to carry out sawing either from the underside, or from the occlusal surface.

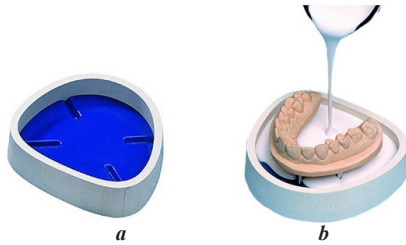


Fig. 23. Rubber mould base former (*a*) and base poured with gypsum material (*b*)



Fig. 24. Separation of the cast base and the part with dowel pins from each other in one block

### Method of working cast production with separate die system by inserting dowel pins in the premanufactured base plate

There is method of working cast production with separate die system by inserting dowel pins in the premanufactured base plate in modern dentistry (Zeiser Model System — Precision Model System, Giroform Amann Girschbach, etc).



Fig. 25. Tools and equipment necessary for working cast production with separate die system by inserting dowel pins in the premanufactured base plate (the description in the text)

For this method of working cast production is required to use: premanufactured base plates (fig. 25, *a*), impression carrier (fig. 25, *b*), plate holder (fig. 25, *c*) and drilling machine (fig. 25, *d*). Silicone putty or plasticine, brass dowel pins and type IV of gypsum products are auxiliary materials for this system.

The sequence of working cast production with separate die system by inserting dowel pins in the premanufactured base plate is shown in Fig. 26 and includes the following steps:

1. The impression is leveled, blocked out with silicone putty or plasticine, and positioned over the impression carrier (fig. 26, *a*)
2. The base plate is securely clamped in the plate holder, the plate holder is positioned over the impression on the impression carrier, this construction is placed on the table of drilling machine, the holes for dowel pins are drilled (fig. 26, *b*)
3. The base plate is removed from the base holder and the dowel pins are inserted into the base (fig. 26, *c*).
4. The impression is poured out with type IV of gypsum products, the area around the pins is filled with the same material, the base plate is inserted into the gypsum material (fig. 26, *d*).
5. The cast is separated from the impression when set and then separated from the base (fig. 26, *e*).
6. The cast is sawed and the dies are fitted on the base plate (fig. 26, *e*).

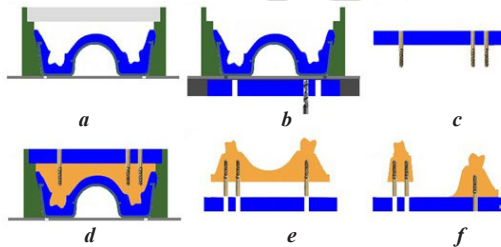
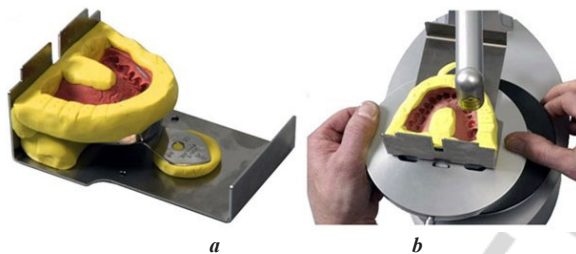


Fig. 26. The sequence of working cast production with separate die system by inserting dowel pins in the premanufactured base plate (the description in the text)

The impression is leveled, blocked out with silicone putty or plasticine, and positioned over the impression carrier (fig. 27, *a*). The base plate is securely clamped in the plate holder. This construction is positioned over the impression on the impression carrier. Connection between them is carried out by the pins in the holder and the holes in the carrier. This construction is placed on the table of drilling machine (fig. 27, *b*). Two holes for each segment in the base plate are drilled with a laser point of drilling machine. The device allows to target the place for the future hole and to fix the position by pressing the button, which simultaneously starts the process of drilling.





*Fig. 27.* The positioning of the impression with silicone putty over the impression carrier (a) and the placement of the impression carrier with the base holder on the table of drilling machine (b)

The base plate is removed from the plate holder after the drilling process and the base plate is fitted with pins (fig. 28). A reliable fixation of pins in the base plate is provided by smooth, at the same depth and parallel holes.

The impression is poured out with type IV of gypsum products. The area around the pins is filled with the same material. The base plate is inserted into the gypsum material until it comes into contact with the silicone putty or plasticine.

The cast is separated from the impression when set and then separated from the base by lightly tapping the hammer on the center of it. The cast is sawed and the dies are fitted on the base plate (fig. 29).



*Fig. 28.* The insertion of pins into the premanufactured base plate



*Fig. 29.* The cast with the base plate

There are methods of production of working cast with separate die system without using of dowel pins in modern dentistry. Working cast is made using preformed plastic trays with internal orienting grooves and notches (Model Tray System, Model-tray GmbH, Germany, BAFIX, DTD systems, Spain, Accu-Trac, Coltene/Whaledent, Switzerland, Full Arch Tray System, Song Young, Taiwan, etc.) or by using premanufactured base plate with vertical dowel pins (Model system 2000, Baumarn, Germany, Fino quick plus Model System, FINO, Germany, etc.).

## METHOD OF WORKING CAST PRODUCTION WITH REMOVABLE DIE SYSTEM

### Method of working cast production with removable die system by using preformed plastic trays with internal orienting grooves and notches

A precise, convenient in work and easy to use systems is required to use special base plates of the tray. Base plates are made of high-strength polymer materials. There are grooves and notches on the inner surface of the base plates (fig. 30). Because of them cast dies can be easily reassembled in the tray. There are locking arms (fig. 30, *a*) or curved arms (fig. 30, *b*) in the base plates for prevention of vertical displacement of cast dies.



Fig. 30. Base plate with locking arms (*a*) and base plate with curved arms (*b*)

There are partial and complete preformed plastic trays with internal orienting grooves and notches (fig. 31).

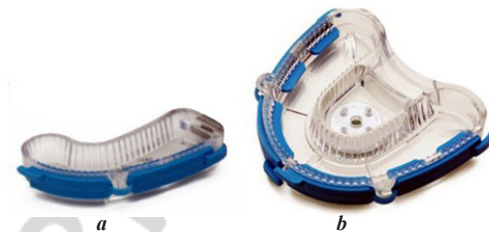


Fig. 31. Preformed plastic trays with internal orienting grooves and notches: partial (*a*) and complete (*b*)

The sequence of working cast production with removable die by using preformed plastic trays with internal orienting grooves and notches is shown in fig. 32. The base plate is prepared to work with closed locking arms (fig. 32, *a*). The margins and palatal/lingual area of impression are trimmed to ensure its fitting to the base plate. The lines for future matching between the base plate and the

impression can be pre-marked. The impression and the base plate are poured by the type IV of gypsum product, afterwards the impression is seated on tray (fig. 32, *b*). This matching is provided by pre-marked lines (fig. 32, *c*). Excess gypsum material is removed. After the gypsum material has fully set, the impression is separated from the cast (fig. 32, *d*), the locking and curved arms of the tray are removed. Then cast can be removed by tapping on the front of the base plate (fig. 32, *e*). Excess gypsum material from vestibular and palatal/oral surfaces of base plate is removed, cast is sawed and then the cast and dies are reassembled in the tray. Locking arms or curved arms are set in the original position (fig. 32, *f*).

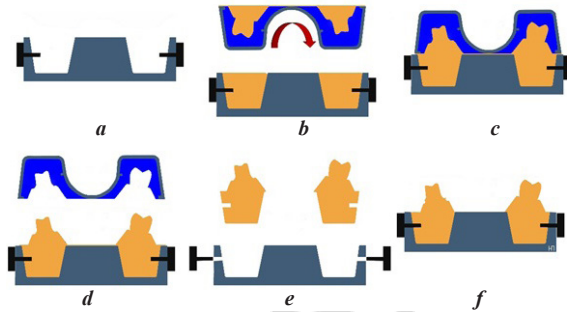


Fig. 32. The sequence of working cast production with removable die by using preformed plastic trays with internal orienting grooves and notches

Method of working cast production with removable die by using preformed plastic trays with internal orienting grooves and notches provides pouring of cast and base simultaneously, what saves working time. This system is universal for production of working cast of upper and lower jaws. Cast dies can be easily reassembled in the same position in the tray due to the original shape of base plate (fig. 33).

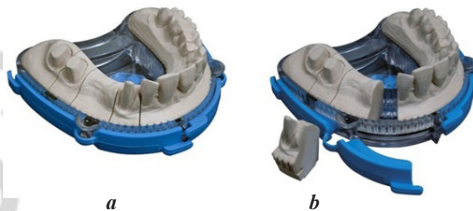


Fig. 33. Preformed plastic tray with internal orienting grooves and notches with the cast inside (a) and with separated die (b)

## Method of working cast production with removable die system by using premanufactured pin base plate

Method of working cast production with removable die system by using premanufactured pin base plate allows to get the desired result while maintaining high accuracy compared to the conventional cast making with using of dowel pins.

Special systems are used for this method. Fig. 34 shows the components of the system which is used for working cast production with removable die system by using premanufactured pin base plate.



*Fig. 34.* Denomination of the different components of FINO Model System (Germany):  
*a* — archiving plate large and small; *b* — detaching tool; *c* — sleeves large and small; *d* — pin base plate large and small; *e* — separating agent

The set of system depends on manufacturer. Some of systems include a hammer for pin base plate separation from the cast instead to the detaching tool. There are systems with metal pin base plate or with plastic pin base plate. A set of tools for cleaning the pin base plates of gypsum material can be included in some systems. In addition, the pin base plates can be complete or partial.

The sequence of working cast production with removable die system by using premanufactured pin base plate is shown in fig. 35.

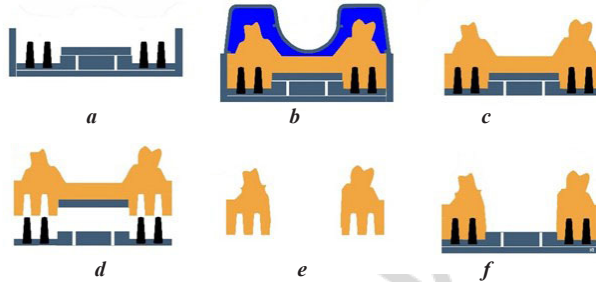
In order to obtain a flat die arch and to facilitate the later removal, the impression is trimmed in the vestibular area and in the palatal/lingual area in a way that deep undercuts are beveled.

First of all, the correct size of the pin base plate is selected according to the impression. The fitting sleeve is placed on the pin base plate (fig. 35, *a*). The pin base plate is insulated with the included separating agent by spaying on a thin even film to prevent connection with gypsum materials. After drying the insulation from the outer margin is removed.

The impression and the pin base plate with the sleeve are filled with one portion of type IV of gypsum material. The impression is placed on the pin base plate and

position at the center, occlusal surface is adjusted parallel to the pin base plate if possible (fig. 35, *b*). Excessive gypsum material is removed by gypsum knife.

After setting of the gypsum material the impression and the sleeve are separated from the cast (fig. 35, *c*). The pin base plate is taken off to get access to the holes for the detaching device.



*Fig. 35.* The sequence of working cast production with removable die system by using premanufactured pin base plate (the description in the text)

The detaching device is placed into the holes on the bottom of the pin base plate designed for this purpose. By screwing at the detaching device the cast is carefully taken off (fig. 35, *d*, fig. 36).

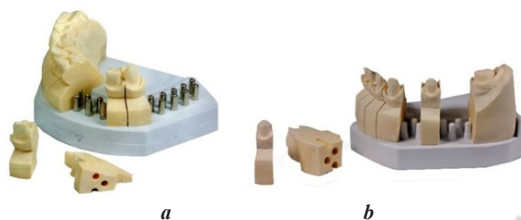


*Fig. 36.* By screwing at the detaching device the die arch is taken off

When the cast is carefully taken off, trimming of it is carried out (fig. 35, *e*). The vestibular aspect of the cast is trimmed by dry model trimmer. For the preparation of the oral aspect a die arch cutter or a pointed cutter are best suitable. The cast is sawed.

Before the cast is repositioned, the pin base plate must be cleaned thoroughly with warm water and common rinsing agents. A hand brush with plastic bristles is best suitable for cleaning of the pins. The dies are fitted on the base plate (fig. 35, *f*) or on the archiving plate.

Fig. 37 shows the working casts with removable die system produced by using premanufactured pin base plate.



*Fig. 37. Models manufactured with metal pin base plate (a) and plastic pin base plate (b)*

A precise, reusable system of working cast production with removable die system by using premanufactured pin base plate reduces the time of manufacture compared to the conventional cast making with using of dowel pins by 70 %.

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## **МЕТОДЫ ИЗГОТОВЛЕНИЯ ГИПСОВЫХ МОДЕЛЕЙ**

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На английском языке

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