

Chapter 2

Classification and Characteristics of Furniture

2.1 Characteristics of Furniture

Furniture is objects of applied arts intended for mobile and permanent furnishing of residential interiors. Among other things, it serves for storage, work, eating, sitting, lying down, sleeping and relaxing. Furniture can be used individually, in suites or sets.

A furniture suite (Fig. 2.1) is a collection of articles, often of different features, but with a similar purpose, having identical or very similar aesthetic form. They are made through the implementation of a specifically determined design work, in which goal might be, for example, furniture for the dining room: in a flat, residence or hotel. A characteristic feature of a suite is that individual pieces of furniture can be combined according to different, but logical rules. The following criteria for completing suites are most frequently adopted: type of material, wood species, type of surface finish, place of use of the furniture, and the historical period in which the furniture was made or what period it refers to stylistically. A lounge suite can consist of two or three armchairs, two double sofas or two corner reclining sofas. A suite is also three armchairs, pouffe and reclining double sofa. Another suite can be a corner reclining sofa and an armchair with a container. A suite for storage can consist of a clothes cupboard, a library bookcase, a bar and glass case, as well as a dresser, chest of drawers, glass case and cabinet. A suite for the dining room can include a dresser, cabinet, dining table, chairs and side table. A kitchen suite usually consists of upper and lower cabinets or built-in cabinets, but may be supplemented with a table and chairs, buffet or bar. A suite of office furniture can consist of a series of filing cabinets, shelves for files, cabinets with sliding shutters, work tables with chairs and dividing walls. A suite of study furniture can include a desk, side table, armchair, wardrobe, library bookcase and table with chairs.

A furniture set (Fig. 2.2) can contain both individual furniture pieces and furniture suites. Furniture constituting a set, unlike furniture included in suites, may have a different purposes and different aesthetic and structural forms.

Fig. 2.1 A furniture suite for the dining room (Furniture Collection Klose, Juvena, designed by Zenon Bączyk)



Fig. 2.2 Furniture set (Furniture Collection Klose, Juvena, designed by Zenon Bączyk)



However, they can be grouped together in sufficiently harmonious collections. A characteristic feature of a set is that the individual furniture pieces or suites were created independently of each other and were not the product of a coherent idea of one designer or team of designers.

2.2 Classification of Furniture

Furniture belongs to the group of objects of applied arts, and many of them have similar structural, technological, functional, operational and aesthetic features. For these reasons, making a distinctive and obvious division of furniture is difficult and to a large extent depends on the experience and intuition of the author of such a division. The main difficulties which may arise in the future, when creating new divisions of furniture, result primarily from:

- the development of new technologies of production and use of new materials,
- the use of identical furniture in various places and in different conditions of exploitation,
- coincidence, i.e., that various furniture pieces have similar functions in similar places of use and
- blurring of boundaries of clear criteria for the division of furniture.

Taking into account the presented concerns associated with the division of furniture, as well as taking into account the need to systematise names for existing and new designs of furniture, it is necessary to build a more or less orderly and logical classification. Classification is the arrangement of objects, including furniture, depending on the classes, sorts, types, forms and general features. By building a useful classification of furniture, it can be divided according to the following criteria:

- purpose—according to the place of use,
- functionality—according to the nature of human activity associated with this or other type of furniture piece,
- form and construction—defining the form and technical solutions of the furniture piece, their mutual influence on each other and on the surrounding environment,
- technology—determining the type of materials used, type of treatment, the method of manufacture of the product and the methods of finishing the surface and
- quality—characterising the most important requirements in the processes of design, construction, manufacture and exploitation of the furniture.

2.2.1 Groups of Furniture According to Their Purpose

In terms of purpose, i.e. the conditions and nature of use, furniture can be divided into three distinct groups. For furnishing:

- offices and public buildings (office furniture, school furniture, dorm furniture, hotel furniture, cinema furniture, hospital furniture, canteen furniture, common room furniture, etc.),
- residential rooms in multi-family and free-standing buildings (flat furniture, kitchen furniture, bathroom furniture, garden furniture) and
- transport (ship furniture, train furniture, aircraft furniture).

This division is extremely important, especially when shaping the technical assumptions for a new product. The requirements and conditions of use included in the design and manufacturing process are different for ship furniture, different for office furniture and different for hospital or school furniture.

In the group of furniture for offices and public buildings, there is another subgroup related to specific human activities:

- furniture for administration,
- furniture for offices and studies and
- furniture for workers.

The nature of work and method of use of rooms in office buildings and public buildings requires designing furniture intended for managers, group leaders, assistants and secretaries, employees working in groups and individually, serving internal and external clients. Within this group, the separate subgroups constitute hospital furniture, school furniture, furniture for waiting areas at train stations, airports, as well as restaurant and cafe furniture. The nature of these furniture pieces should correspond to the specific requirements of many different and often anonymous users. School and office furniture should be well suited to the anthropometric parameters of individual groups of users. Hospital furniture should be conducive to rehabilitation and should minimise the negative phenomenon of prolonged pressure of the human body on a mattress or seat. Furniture intended for use in waiting rooms is required to ensure high durability and functionality, adapted to the nature of travel of prospective users.

Furniture for residential rooms in multi-family and free-standing buildings should comply with the requirements of individuals and families, living together in a house or flat, as well as be able to perfectly incorporate into the room and make it possible to perform everyday activities in these rooms. The furniture should meet all the functional needs of the following zones: relaxation and lounging, sleep, work, learning, preparing and eating meals, physiological needs and maintaining personal hygiene, and storage.

Marine, vehicular (car and train) and aircraft transportation have very high demands in terms of quality of material used in the manufacture of furniture, quality of make and safety of use of furniture built into the body of the transport units carrying people.

2.2.2 Groups of Furniture According to Their Functionality

In terms of functionality, furniture can be divided into the following groups:

- for sitting and lounging,
- for reclining,
- for working and eating meals,
- for learning,
- for storage,
- multifunctional furniture and
- complementary furniture.

Each of the given groups is characterised by specific properties and requirements:

- of exploitation, that is the character of the performed task,
- anthropotechnical, that is adjusting the user's anthropotechnical characteristics to the technical features of the operational object,
- sanitary and hygienic,
- pedagogical and
- construction.

A group of furniture for sitting and lounging comprises typical chairs, tabourets, stools, pouffes and bar stools, which do not or only partially provide support for the user's back (Fig. 2.3a–e), as well as armchairs, sofas, chaise lounges and corner sofas, supporting the whole body or its major part (Fig. 2.3f–i).

Furniture for reclining should ensure comfortable and continuous support of the human body in a reclining position. There are, however, structures that not only meet this basic function, but also provide support for the body in a sitting position. For this reason, furniture for reclining can be divided into two subgroups (Fig. 2.4):

- only with reclining function, such as beds, couches and mattresses (Fig. 2.4a–c) and
- with a reclining and sitting function, such as folding sofas, sofas and corner sofas (Fig. 2.4d–f). In this subgroup of furniture, the change of function can be achieved by using fittings and accessories that enable to transform the piece of

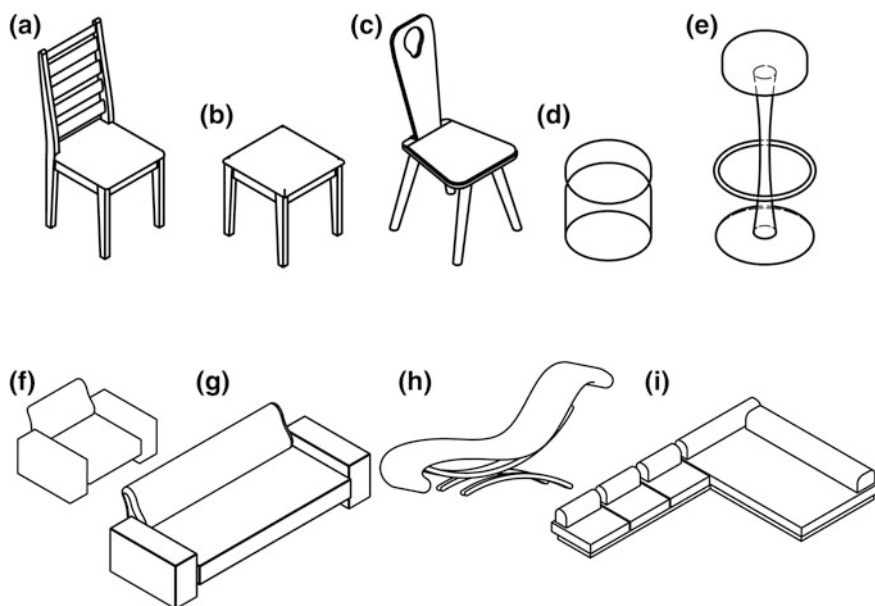


Fig. 2.3 Furniture for sitting and lounging: **a** chair, **b** tabouret, **c** stool, **d** pouffe, **e** bar stool, **f** armchair, **g** sofa, **h** chaise lounge, **i** corner sofa

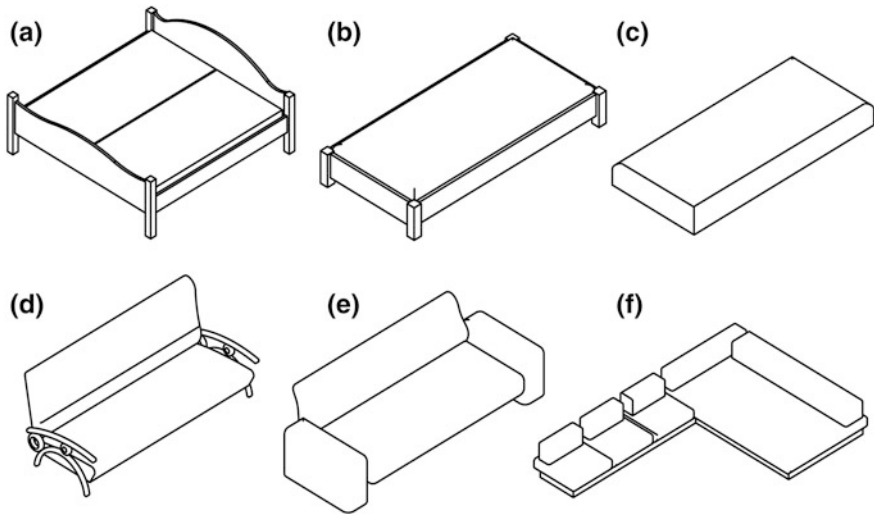


Fig. 2.4 Furniture for reclining: **a** bed, **b** couch, **c** mattress, **d** folding sofa, **e** sofa, **f** corner sofa

furniture and unfold or fold the reclining surface. However, if the dimensions of the seat are significant, the reclining function can be provided without the need for transforming the geometry of the piece.

The group of furniture for working and eating meals mainly consists of tables, table add-ons, desks, side tables, buffets and reception bays (Fig. 2.5). Tables can be used to work, study, prepare and consume meals, games, as well as bases for apparatus, instruments, flowers or lighting. Here, we distinguish tables for the dining room, kitchen, conference rooms, construction offices, trade offices, editorials of magazines, schools, kindergartens, etc. The tables for dining rooms can usually change the geometry of the work surface, increasing its length and at the same time, area for future users. Tables and desks for offices usually have a fixed geometry of the work surface, but they have step or stepless adjustment of its position height. The change of the geometry of the work surface of office furniture is provided by applying side tables and add-ons. These furniture pieces are designed by particularly considering the arrangement of devices and objects that are the basic equipment of the workplace, including the computer, telephone, notepad, writing supplies, binders and other office accessories requiring compartments, drawers, boxes, slides, hangers and top extensions. A problem at the design stage of the integration of form, function and structure of the furniture piece is providing an exit and hiding cables delivering certain media to electrical devices.

Reception bays are a unique type of furniture designed to work, for they are an obvious flagship of an institution—they stand in the lobby or the hallway, where clients are welcomed. They should not only enable the performance of precision work in a sitting position, but also hard work in a standing position.

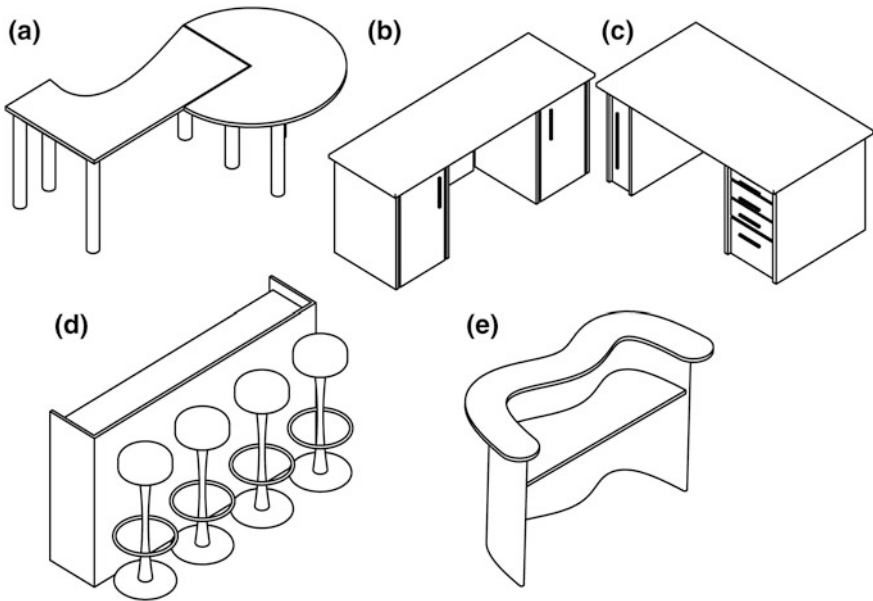


Fig. 2.5 Furniture for work and dining: **a** table and table add-on, **b** side table, **c** desk, **d** buffet, **e** reception bay

Furniture for learning is primarily benches, pupil tables, drafting tables and davenport (Fig. 2.6). When designing furniture belonging to this group, in particular school furniture, one must anticipate a different than normative structure load and guarantee the furniture's adequate stiffness, strength and stability. One must also remember to use such structural components for which the designer has certificates of their complete non-toxicity.

The group of storage furniture represents cabinets, bookcases, shelves, dressers, chests of drawers, cabinets, containers, dressing tables and library bookcases (Fig. 2.7). This is most numerous and diverse group of furniture, with a wide variety of forms and dimensions depending on the type, shape and size of the stored items.

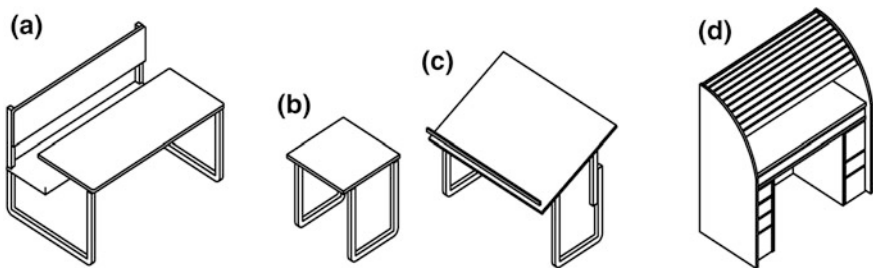


Fig. 2.6 Furniture for learning: **a** bench, **b** pupil's table, **c** drafting table, **d** davenport

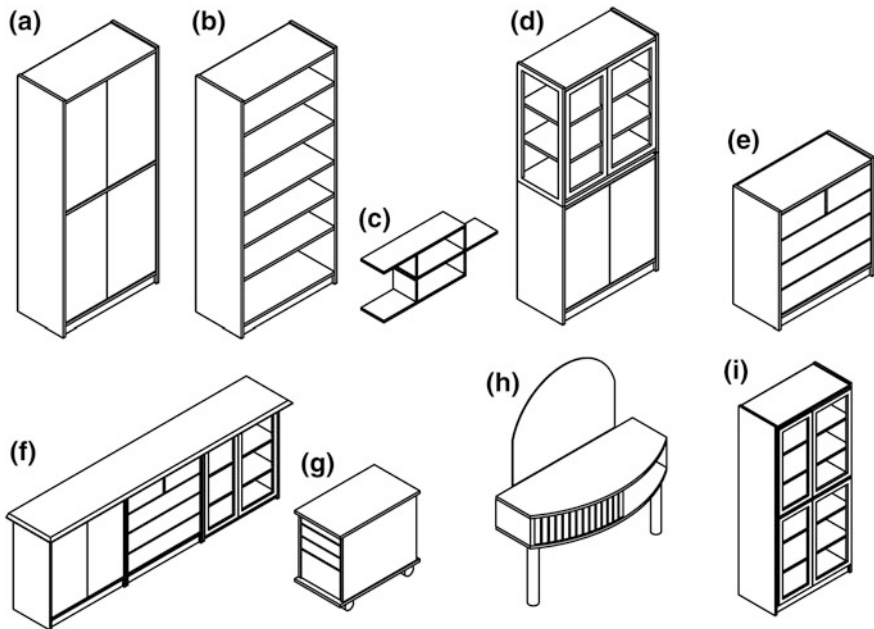


Fig. 2.7 Furniture for storage: **a** wardrobe, **b** bookcase, **c** shelf, **d** dresser, **e** chest of drawers, **f** buffet, **g** container, **h** dressing table, **i** library bookcase

Depending on the degree of connection with the room, furniture from this group can be divided into mobile (not connected to the construction elements of the room, e.g. containers, chests of drawers, cabinets, buffets and chests) and stationary (connected impermanently with the construction elements of the room, e.g. wall cupboards, shelves, partitions or tall standing cupboards).

Multifunctional furniture originated from the need to meet the many different needs of users. These needs appeared for a number of reasons. The first were the dreams of wealthy clients of having products that were unique in form, with surprising technical solutions, and enabling users to meet several practical administrative needs. Modern multifunctional furniture pieces are often adapted by necessity to minimum living space, the nature of work and financial possibilities of future owners. Usually, multifunctional furniture can be found among sofas with a reclining function, couch beds, couch shelves, escritoirs for work and storage (Fig. 2.8).

The group of complementary furniture constitutes flower beds, covers, partition walls and side tables. Mostly, they are manufactured for individual needs of clients who are furnishing their rooms completely and expecting a uniform form, construction and technology of manufacture in order to maintain consistency of the interior's look and aesthetics.

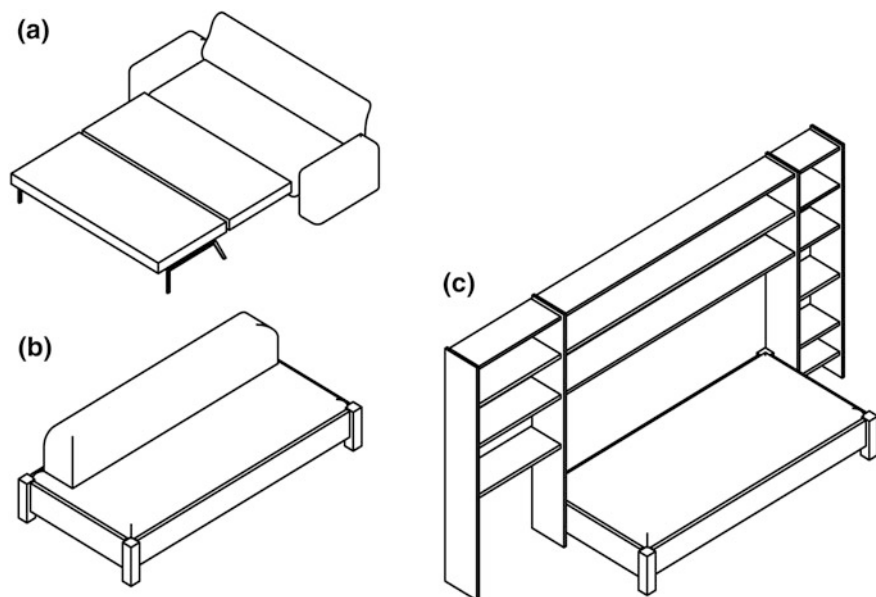


Fig. 2.8 Multifunctional furniture: **a** sofa with reclining function, **b** couch bed, **c** couch shelf

2.2.3 *Groups of Furniture According to Their Form and Construction*

The characteristics of form and construction of the furniture piece are determined on the basis of spatial organisation of form, interconnection of main structural components and architectural structure of the product. Depending on the spatial organisation of the form, i.e. from the spatial distribution of individual elements of the furniture piece, three basic schemes of furniture can be distinguished (Fig. 2.9):

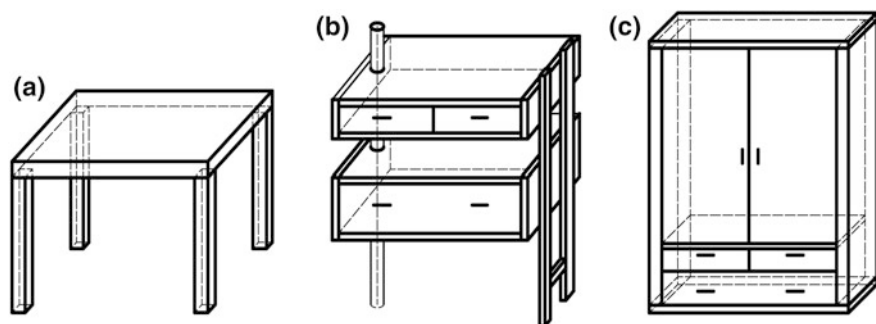


Fig. 2.9 Spatial organisation of the form of the furniture piece: **a** with an open spatial structure, **b** with a partially open spatial structure, **c** with a volume spatial structure

- with an open spatial structure, in which linear and surface elements dominate,
- with a partially open spatial structure, in which linear, surface and volume elements can dominate and
- with a volume spatial structure, in which volume elements dominate with small participation of linear and surface elements.

In furniture with a volume spatial structure, an additional feature can be distinguished—modularity. This feature of furniture increases functionality, many variants of use, as well as quality of the designed and furnished interiors. Modular furniture is designed on the basis of a body with a universal structure of elements, which maintains unified and repetitive closed dimensions in universal templates, with the possibility of any completion and decompletion of the system. Completion of systems can be done vertically, horizontally and matrixwise by using a system of simple connections between the elementary solids of furniture. Depending on the design, modular furniture can be divided into (Fig. 2.10):

- single-bodied,
- multi-bodied,
- universal for completion,
- on a frame and
- for hanging.

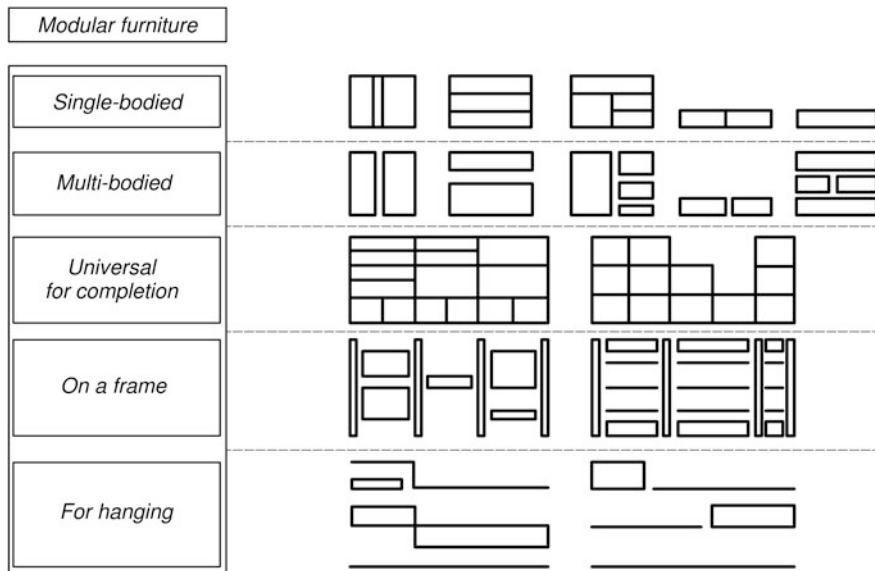


Fig. 2.10 Examples of modular furniture

Due to the method of binding certain structural components, subassemblages and assemblages, furniture can be divided into:

- non-disassembling, produced in the form of compact blocks, which makes their disassembly impossible,
- disassembling, produced in the form of solids that provide the possibility of repeatable disassembly and reassembly and
- for individual assembly, sold in packages containing elements for repeatable assembly and disassembly.

Taking into account the characteristics arising from the design of the furniture, two main groups can be distinguished:

- case and
- skeletal.

Case furniture is built mainly from panel elements, in which thickness is several times smaller than the other dimensions. Typically, these elements are located relative to each other in such a way that closes space from five or six sides. Depending on the relative positions of the external elements of the furniture piece's body, two subgroups of case furniture have been distinguished (Fig. 2.11):

- flange, in which the top and bottom of the furniture piece (called flanges) are placed from the top and the bottom on the side walls. In this case, the upper element is called the top flange and the bottom element, the bottom flange. Such a piece of furniture can be supported on legs, a frame or a socle,
- rack, which are characterised by the fact that the top and bottom of the furniture piece can be found between the side walls. In this case, the structural solutions for the base part are as follows: the furniture piece can be supported on legs, a frame, socle, or on extensions of the side walls to the bottom, which are called racks.

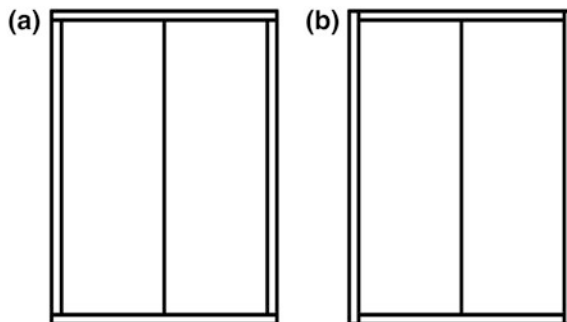


Fig. 2.11 The division of case furniture depending on the relative positions of the sides, and top and bottom of the furniture piece: **a** flange, **b** rack

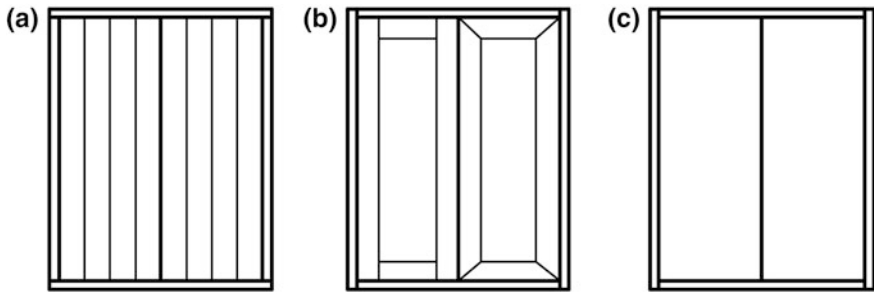


Fig. 2.12 The division of case furniture depending on the design of visible parts: **a** slat, **b** frame panel, **c** board

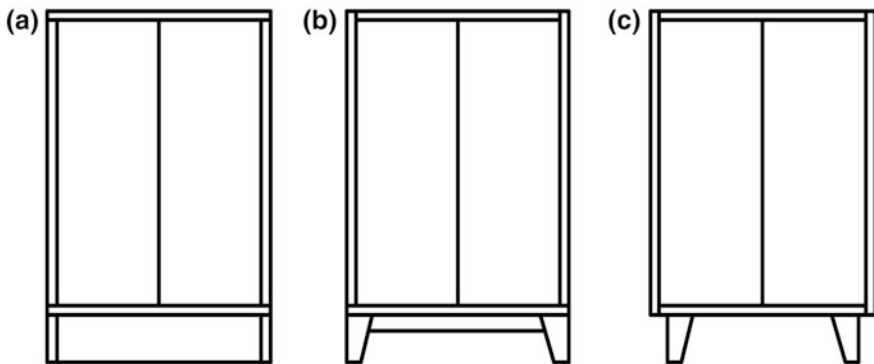


Fig. 2.13 Body of furniture placed on **a** socle, **b** frame, **c** legs

Due to the nature of the structure, visible parts or external elements, case furniture is divided into (Fig. 2.12):

- slat,
- frame panel and
- board.

Given the solutions of designing support construction of case furniture, bases are distinguished in the form of a socle, a frame and legs (Fig. 2.13).

Depending on the construction and the technological characteristics, the following furniture is distinguished:

- segment, in which structure, external dimensions and functionality allow their vertical or horizontal configuration and
- compact, built from elements of unified dimensions and construction solutions that enable folding any suites of different purposes and dimensions.

Case furniture can be single- or multifunctional, which enables to use them in different ways, for example:

- a wardrobe, a tall case furniture piece designed primarily to store clothing, bedlinen, office binders, folders, drawings, etc.,
- library bookcase, a cupboard with shelves and mostly glass doors designed to store books,
- bookcase, a furniture piece consisting of a few or a dozen or so shelves hung on the side walls, with or without a rear wall, open or partially closed,
- glass case, glass cupboard or top part of a dresser, for storing decorative ceramics, dishes and jewellery,
- dresser, serves to store dishes, table linen, cutlery, etc.,
- buffet, a type of dresser, intended to be laid with occasional meals,
- chest of drawers, a low cupboard with drawers for storing bedlinen and clothing,
- overhead cupboard, cupboard at the ceiling used for storing rarely used items,
- wall unit, a set of furniture that fulfils all storage functions and at the same time serves to divide rooms and
- built-in set, wall set of furniture, usually closed, used for storage.

Skeletal furniture is made of elongated elements with small cross sections, in the shape of a square, rectangle, triangle, circle, oval, etc., not closing space within it, e.g. chairs, armchairs, tables and flower beds. The shape of the cross sections of these elements determines the next division of frame furniture into:

- beam furniture, in which the cross section of elements is a polygon and
- rod furniture, which is built using elements of circular, ellipse, oval or similar to circular cross sections.

Depending on how the seat or worktop is supported, we can distinguish furniture of the following designs (Swaczyna and Swaczyna 1993) (Fig. 2.14):

- board,
- cross,
- with rails,
- without rails,
- frame,
- column,
- rack and
- one piece.

Furniture of a board structure is made mainly from elements cut from timber (ready part) or by gluing friezes in the direction of their width and then cutting out the desired shape. The base of the furniture piece is made up of board elements, the width of which is several times greater than the thickness.

Furniture of cross-structures is made of beam or rod elements joined by hinges and slides. Usually, this construction enables folding and unfolding the piece of furniture both in the direction of the width of the seat and in the direction of its depth. This lets the seat be made of textile or leather materials. In this type of

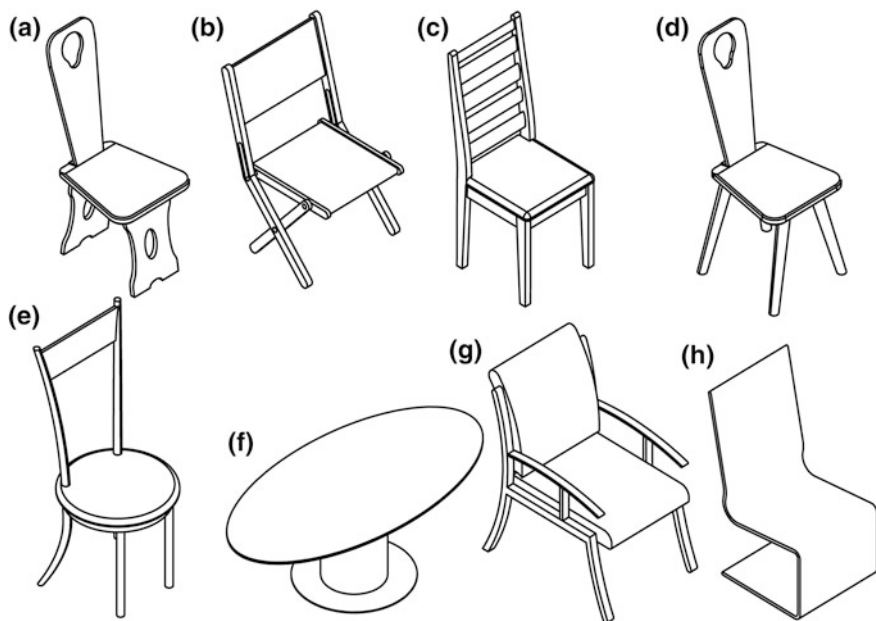


Fig. 2.14 Division of furniture depending on seat or worktop support: **a** board, **b** cross, **c** with rails, **d** without rails, **e** frame, **f** column, **g** rack, **h** one piece

construction, only axial and transverse forces are transferred through structural nodes; therefore, high strength of wood against bending and torsion is not used.

Rail structure, as opposed to cross-construction, in the vast majority of cases, is inseparable. Thanks to permanent joining of legs with rails, a spatial frame is formed, which transfers axial and transverse forces, as well as bending and torsion moments. Thanks to these geometric features, the stiffness and strength of furniture of rail structure is much greater than with a different structures.

Structure without rail is distinguished by the fact that the base of the furniture piece is legs attached directly to the seat panel or worktop of a table. Cantilever mounting of the leg and usually deviating its axis from the vertical line causes that very large bending moments work on joints, which is the cause of damages of connections.

Furniture of a frame structure under the seat or worktop has fixed frames, to which the legs are attached. Usually, the frame is made of bent-glued elements, and friezes connected in the direction of their length or metal sections. The legs are usually connected with the frame using screws. However, it should be noted that this method of connecting construction components does not provide permanent stiffness and high strength of the base of the furniture piece. Bolt joints belong to the semi-stiff group of joints. Therefore, they have better mechanical properties than hinged joints, but at the same time, worse than adhesive joints belonging to stiff joints. With the passage of time, the stiffness of bolt joints decreases both due to the

deformation of the hole by the hard core of the bolt or screw and due to the minimal changes in the moisture of the wood.

In furniture of a rack structure, the seat or worktop is attached on subassemblies that resemble racks. Usually, racks are made in the form of frames or rails connected to the seat with screws. It also happens that below the seat or worktop of a table, the side frames are connected with each other using front and rear rails. If bolt joints are not used, then the stiffness and strength of furniture of rack structures corresponds to the stiffness and strength of furniture of structure with rails.

The column structure of a skeletal furniture piece is distinguished by supporting the seat or table using one or two columns, which have been made in the form of turned wooden trunks, supported on legs or a plate, oval columns or multi-element supporters made of rods, strips or boards. Usually, the column enables to assemble in it a mechanism that allows one to change the height of the seat or worktop, as well as feeding cable lines connecting media to electrical devices installed on the table.

Furniture of one-piece structure is created mainly based on technologies of injecting plastic or natural fibrous materials. In furniture made of wood and wood-based materials, the technology of bending and simultaneous bonding of multiple thin layers of veneers is most commonly used.

2.2.4 Groups of Furniture According to Technology

By creating a division of furniture according to the technological characteristics, one should keep in mind both the variety of used machining processes and the types of materials used, as well as methods of finishing visible surfaces.

Technologies of manufacturing furniture can be brought together into four main groups: machine cutting, machine bending, weaving, and the technology of cutting and sewing cover materials. In terms of these technologies, furniture is divided into the following groups (Fig. 2.15):

- carpentry,
- bent,
- woven and
- upholstered.

Carpentry furniture is made of wood or wood-based materials by way of the classical machine cutting. These include the following:

- turned furniture,
- carved furniture and
- typical carpentry furniture.

Bent furniture is commonly manufactured using the hydrothermal treatment and wood bending or by bending together with simultaneous bonding of thin veneers of wood and wood-based materials. The modern technology of manufacturing

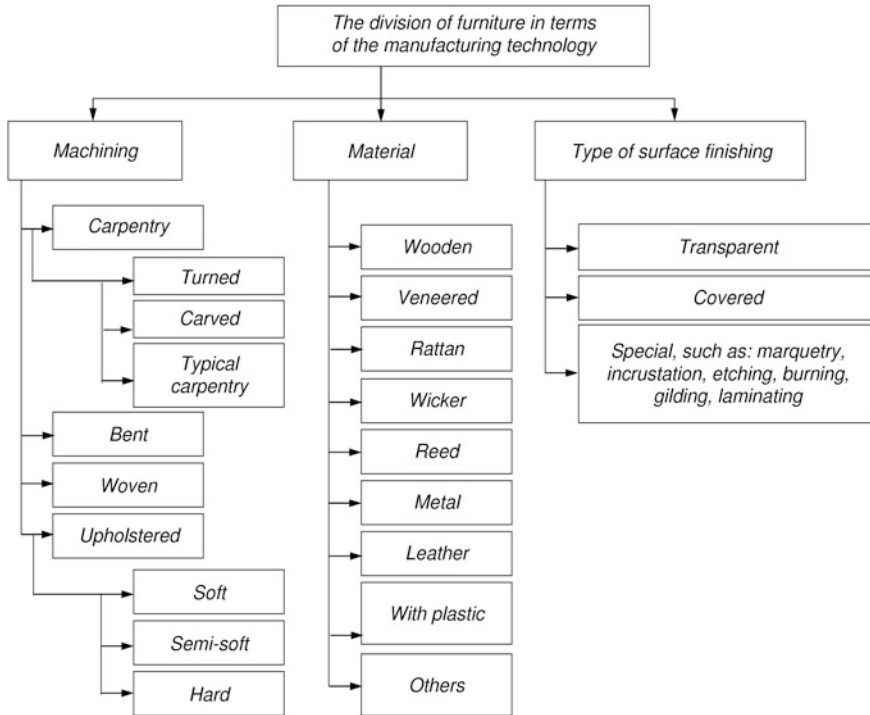


Fig. 2.15 The division of furniture in terms of the manufacturing technology

components for bent furniture production was proposed by the Danish company Compwood Machines Ltd. (www.compwood.dk). This technology consists in softening the wood point by steaming in autoclaves or heating in a high-frequency electric field and then compressing the wood in one axis along the fibres to up to about 80 % of the initial length of the element. After such a process, the element is suitable for free bending or bending using tapes and bending limiters.

Woven furniture is formed primarily by using thin and flexible materials, which can be used to shape full or openwork surfaces of seats, backs and sides of chairs, armchairs and sofas. They also constitute the decorative element of door panels or sides of bodies of case furniture. Usually, for weaving, wicker, rattan, peddigg, bamboo, water hyacinth, raffia and loom are used.

Upholstered furniture has a complex construction and various ways of making the elastic section and upholstered section. They are usually formed by stretching over and fitting of a cut and sewn cover on a frame with an elastic layer. In terms of the measurable criterion of the softness of the mattress or seat, upholstered furniture can be divided into:

- soft,
- semi-soft and
- hard.

This division is quite subjective and in many cases depends on the individual feeling of softness of the seat by the designer or manufacturer. In order to objectify and quantify this division, a value of acceptable pressure on the human body in contact with the mattress should be assumed as the criterion of evaluating softness. Krutul's studies (2004a, b) show that the acceptable level of pressure on the human body, not hampering blood circulation in arteries, veins and capillaries, should not be higher than 32 mmHg = 4.26 kPa. On the basis of the results of the works carried out by Smardzewski et al. (2007, 2008), it was also shown that the value of contact pressure depends on the construction of the mattress and the kind of elastic materials used. The lowest pressure on the human body, with a value of up to 28 mmHg = 3.73 kPa, is obtained on water mattresses. For foam and hybrid systems of foam–spring sets, the value of pressure ranges from 45 to 120 mmHg (from 5.99 to 15.99 kPa). Taking this into consideration, the following numeric indexes can be suggested for the previously proposed division of furniture:

- soft, acceptable pressure on the human body no greater than 5 kPa,
- semi-soft, acceptable pressure on the human body ranging from 5.1 to 9 kPa and
- hard, acceptable pressure on the human body greater than 9.1 kPa.

Due to the type of material used, we divide furniture into:

- wooden, in which at least the basic construction consists of elements made of wood or wood-based materials,
- veneered, in which surfaces are veneered with a thin layer of precious wood—veneer, thin films or decorative papers,
- rattan, in which the basic bearing construction of the furniture piece consists of elements made of rattan bars (rotang) usually with a diameter of 35 mm,
- wicker, in which the entire construction or only the woven back or seat is made of wicker,
- reed, in which the entire construction or only the woven back or seat is made of reed,
- metal, in which the construction is made of metal, while wooden or wooden-based elements are only a supplement,
- with plastic, in which the construction is made of plastic,
- leather, usually upholstered furniture, which has all external surfaces or only use surfaces covered with natural leather and
- others.

Taking into account the method of finishing the surface of a ready product, furniture can be divided into:

- transparent, with a visible structure and drawing of the base,
- covered, with an invisible structure and drawing of the base and
- special, such as marquetry, incrustation, etching, burning, gilding and laminating.

2.2.5 *Groups of Furniture According to Their Quality*

The concept of quality first appeared in the philosophy of Plato, who called it poiotes. Cicero, when creating Latin philosophical vocabulary, for the Greek term, created the Latin qualitas. Hence, qualitas infiltrated some of the Romance and Germanic languages, e.g. as qualita in Italian, qualite in French, quality in English and qualität in German. According to Aristotle, any quality boils down ultimately to two types. Quality in the first meaning is that what constitutes the diversification of the object in itself. The second type of quality constitutes the properties of variable things, i.e. properties in terms of which changes are distinguished (warm and cold, white and black, heavy and light). He also attributes to quality every advantage and defect (Iwaśkiewicz 1999, Łańcucki 2003).

In ancient Egypt, proof of the commitment of builders to quality was the construction of the pyramids, which to this day are testimony to the great craftsmanship of builders. In the Code of Hammurabi (from 1754 BC), it is concluded, among others, that if a mason built a house for a citizen and did not check his work and the wall leaned, this mason will strengthen this wall for his own silver.

The dictionary of the English language defines quality as a property, type, kind, value and set of features constituting that a given object is that object and no other, whereas in the colloquial language, quality usually means an evaluation of the degree in which a given object or service conforms to the requirements of the evaluator. Such an assessment may include all or some of the features of the evaluated object: weight, colour, shape, structure, chemical composition, physical characteristics, impact on the environment, efficiency in the performance of specific functions, etc.

In the literature on the subject (Iwaśkiewicz 1999; Łańcucki 2003), definitions of quality are presented in which, despite the large variety of wordings, there is one fundamental idea that quality means fulfilling the customer's requirements.

The evaluation of the quality of furniture comes down to a detailed analysis of the features of design, construction, functional, ergonomic, safety for the environment and directly for the usage.

Each piece of furniture, as an object of applied arts, in a long life cycle usually passes over two stages: the stage of development, i.e. design and manufacture, and the stage of use, i.e. fulfilling needs. In the first stage, the designer and the manufacturer can only in theory or on a small sample evaluate the quality of the modelled and manufactured products. The real assessment of the quality of the furniture piece takes place only during everyday use by dozens or hundreds of users. Therefore, furniture should be evaluated from two points of view (Fig. 2.16):

- manufacturing and
- requirements of the user.

Among the manufacturing characteristics, construction, technological and economical values are distinguished, which affect both the aesthetics and the safety of using furniture and the technical cost (as low as possible) of manufacturing.

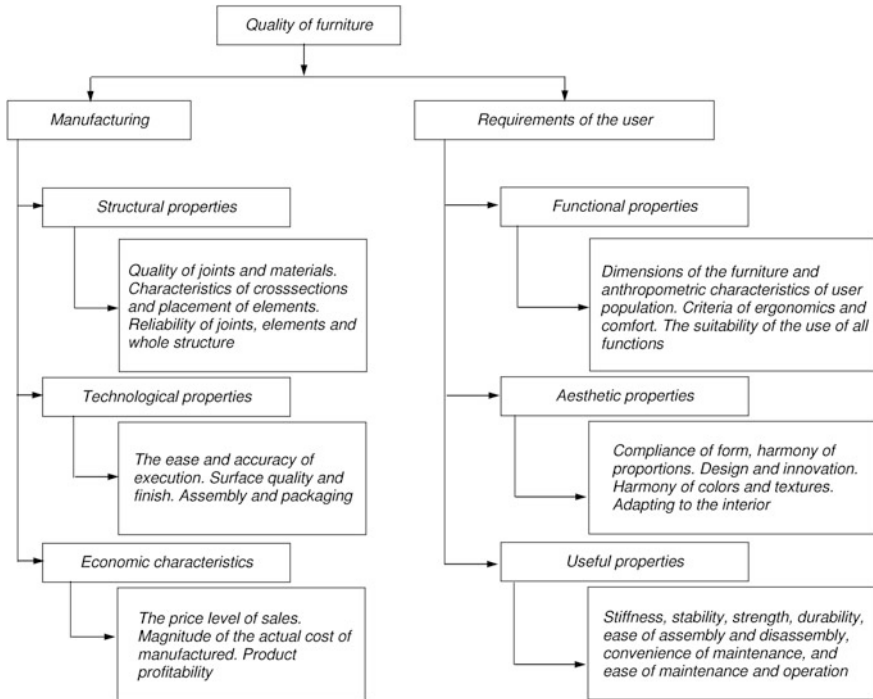


Fig. 2.16 The division of furniture in terms of quality

Among the features associated with the requirements of the user, the following should be named functional, aesthetic and user-friendly.

2.3 Characteristic of Case Furniture

Case furniture is the goods of a volume structure, in which the surface elements limit and close a given space. Among the large group of elements of a case furniture piece, we distinguish:

- the main element, without which the furniture piece loses its functional nature and the construction becomes a mechanism,
- a supplemental element, without which the construction can be maintained, but the furniture piece does not perform the intended functions and
- compensation element, without which the function and the construction can be preserved; however, its use significantly improves the stiffness, strength, durability and reliability.

Each of these elements can be made as:

- a panel element, from a chipboard, carpentry board, MDF, HDF, cellular, composite with the addition of lignocellulosic particles, plywood, etc., and
- an element of solid wood.

Usually, a case furniture piece is made up of a body, front build, interior build, rear wall and frame. Each of these parts has distinctive surfaces, the position and visibility of which, in terms of the user, allow the diversification of finishing and build quality. Here, we distinguish the following surfaces (Fig. 2.17):

- front, visible in furniture piece from the standard position of use, such as the visible surfaces of doors, flaps of bars, fronts of drawers, slides, as well as surfaces of recesses (also glazed) and
- external, visible in the furniture piece at a non-standard position of use.

These include external surfaces of side walls, lids, top flanges located at a height not exceeding 1.8 m, bottoms, bottom flanges, shelves and compartments situated at a height no less than 0.9 m from the floor,

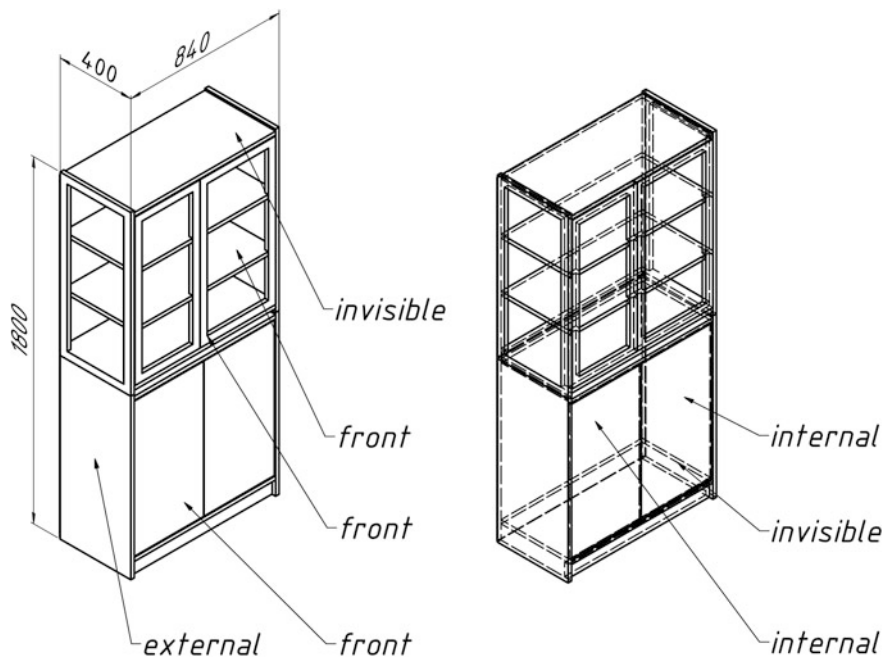


Fig. 2.17 Types of surfaces in a case furniture piece

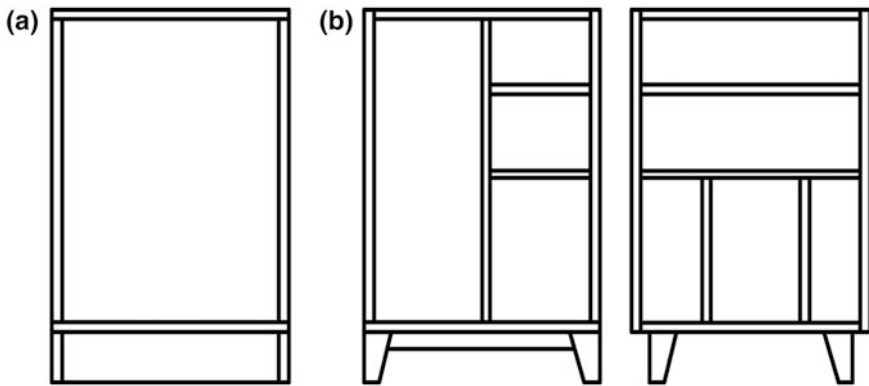


Fig. 2.18 Body of the furniture piece: **a** single-chamber, **b** multi-chamber

- internal, visible in the open furniture piece at a normal position of use. These include the interior surfaces of cabinets, couch chests, drawers and other containers,
- invisible, invisible in the furniture piece at a normal position of use. These also include external surfaces of tops situated at a height not exceeding 1.8 m and bottoms situated at a height no less than 0.9 m from the floor.

Usually, the body of the case furniture piece consists of two side panels, a bottom, a top, partitions and a rear wall. Depending on the number of partitions dividing the space into functional usable areas, we divide the bodies into (Fig. 2.18):

- single-chamber and
- multi-chamber.

The body of the furniture piece can be supported on a frame, stand on rests being an extension of the side walls and can be raised on a socle or rest directly on the floor. Each of these types of structures significantly determines the strength and durability of the furniture piece. This also affects the essential design qualities of the product, harmony of shapes and proportion of dimensions. Usually, furniture mounted on slender, towering frames has a lightweight construction, elegance of form and freedom of use. However, if the body rests on a minute frame, massive socle or directly on the floor, it is usually associated with a heavy form and limited functionality.

The legs of case furniture are made of wood, plastic and metals (Fig. 2.19). Usually, they are attached directly to the underside, perpendicular to its surface. Such fitting provides the legs an axial load and high shearing strength. A disadvantage of this kind of support of the body is the small resistance to lateral forces, causing destructible bending moments at their base. Therefore, in order to obtain an interesting aesthetic effect, they are often designed as cast, welded or moulded elements.

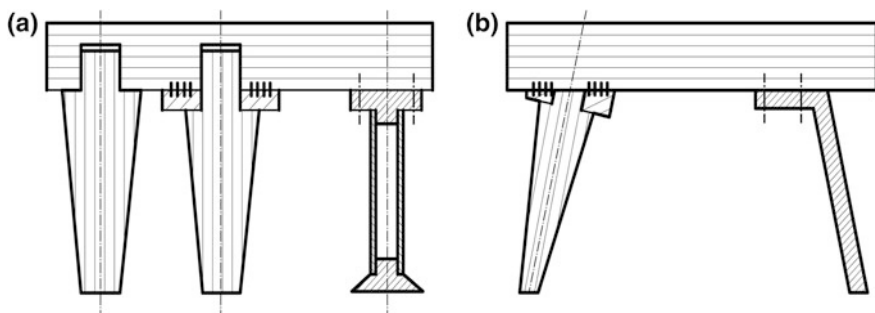


Fig. 2.19 Legs supporting the body of the case furniture piece: **a** perpendicular fitted wooden or metal legs, **b** wooden, metal or plastic legs situated obliquely to the underside

The frames of case furniture most often have two or more legs. They are made of wood, metal, plastic and wood-based materials. Due to the structural bonding of the legs in a uniform frame, from the point of view of durability, the frame constitutes a far preferable solution than single legs (Fig. 2.20).

The base of the furniture in the form of a socle is a mechanically very effective bearing structure. Depending on the number of elements, the following socles have been distinguished (Fig. 2.21):

- three-element,
- four-element and
- five-element.

Three- and four-element socles not only serve an important supporting function, but also improve the stiffness of the body of the furniture piece usually by about 5 %. A five-element socle has an additional lateral element which improves the stiffness

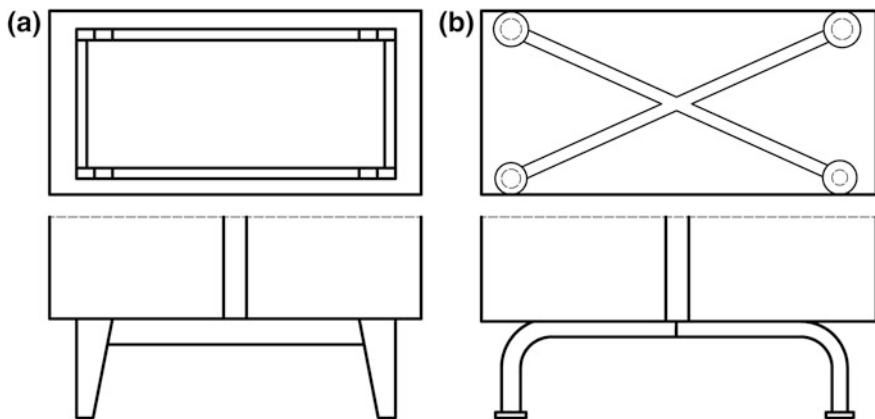


Fig. 2.20 Frames supporting the body of the case furniture piece: **a** wooden, **b** metal or plastic

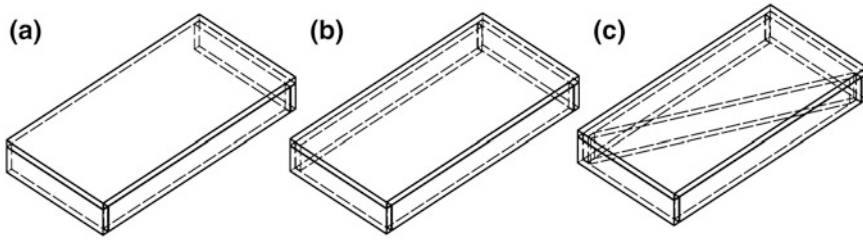


Fig. 2.21 Types of socles: **a** three-element, **b** four-element, **c** five-element

of the body by even up to 100 %. This is due to the fact that most of the elements of the furniture piece's body during natural exploitation are subject to torsion, while the lateral element is subject to bending, which is why the indicator for resistance to bending is used, not for torsion.

Storage in case furniture is enabled by an appropriate number of compartments, shelves, cases and drawers. As elements fixed permanently to the body of the furniture piece, compartments have an impact on its stiffness and strength. The increase in the number of horizontal or vertical compartments clearly leads to a reduction in the thickness of the main and complementary elements. The shelves are movable elements, not permanently bonded with the body of the furniture piece, and in the calculation of the construction's stiffness, it is not taken into account in total equations. However, due to the fact that they carry significant loads, their number indirectly affects the stiffness of the piece of furniture. Indeed, at a specific constant stiffness of the construction, the increase of load causes a linear increase of the displacement of corner nodes of the construction.

Cases and drawers, like shelves, are movable parts (subassemblages) of box furniture and are not included in the calculations of stiffness. Safety of use of furniture for storage requires that all movable elements are protected against ejecting. To this end, for shelves, special supports are applied that prevent movement in the horizontal plane, and for cases and drawers, there are stoppers halting the container after it slides out of the inside of the body to a certain point. For aesthetic reasons, the fronts of cases and drawers can be entered into the body, harmonised with narrow planes of side walls and partitions or placed on these surfaces (Fig. 2.22). For the same reasons, they are done in the same way as other



Fig. 2.22 Ways of inserting the fronts of drawers and doors to the body of the furniture piece: **a** inserting, **b** harmonising, **c** applying on

elements of the front, that is doors, flaps or covers, referring to their design, structural form and technology of finishing.

Like the fronts of drawers, doors can be entered into the body, harmonised with narrow planes of side walls and partitions or placed on these surfaces. Access to the interior of the body is possible by turning or sliding the door. Usually, the rotation of the door, made in the form of boards or panels, takes place on the horizontal or vertical axis, while sliding takes place vertically or horizontally along appropriate straight runners. An interesting variation of a door is blinds, which are made of thin wooden strips glued to a canvas, plastic (PVC ABS, polypropylene) lamellas or aluminium lamellas joined by hinges. Blinds can run in horizontal and vertical runners, in which movement track can be either a straight line or any curve composed of many gentle arcs.

The construction of a case furniture piece is a kind of bonding of its volume, surface and linear elements in a way that is appropriate and enables safe use. It consists of elements, subassemblages and assemblages.

An element of a case furniture piece is a single part made from one material or a few kinds of materials permanently bonded with one another, e.g. top or bottom, side wall or front of drawer veneered with natural veneer.

A subassemblage is an assembled set of elements, which constitute a separate whole during the phase of assembly of the furniture piece, e.g. the socle, body and panel-structured door.

An assemblage is a set of assembled subassemblages or subassemblages and elements, constituting a separate structural unit, fulfilling most commonly a specific function in the piece of furniture, e.g. a top extension on a dresser, a top shelf on a cabinet, a cabinet which is a constituent part of a cabinet and buffet.

Designing furniture, in engineering activities, comes down to the careful design of construction documentation in paper or virtual form. In both of these cases, it is necessary to index and name individual elements, subassemblages and assemblages of furniture, in accordance with the nomenclature used in the industry. It should be noted that along with the introduction of EN-PN norms in Poland, definitions arising as calques of English translations have significantly distorted traditional Polish names and descriptions of constituent elements in furniture. Therefore, this book uses the nomenclature contained in the standard [BN-87/7140-01](#)—Furniture, Terminology.

In case furniture, the following elements are distinguished (Figs. [2.23](#), [2.24](#), [2.25](#) and [2.26](#)):

- the front on the drawer, an element which is the front wall of the drawer,
- bottom, an element which is the fixed bottom limitation of the subassemblage or assemblage in the furniture piece, e.g. the bottom of a drawer and the bottom of a chest for bedlinen,
- laminated board, an element which is the complement of panel elements or structures, mainly for securing or decorating,
- bar, an element which is most often the functional equipment of the furniture piece, e.g. closet bar,

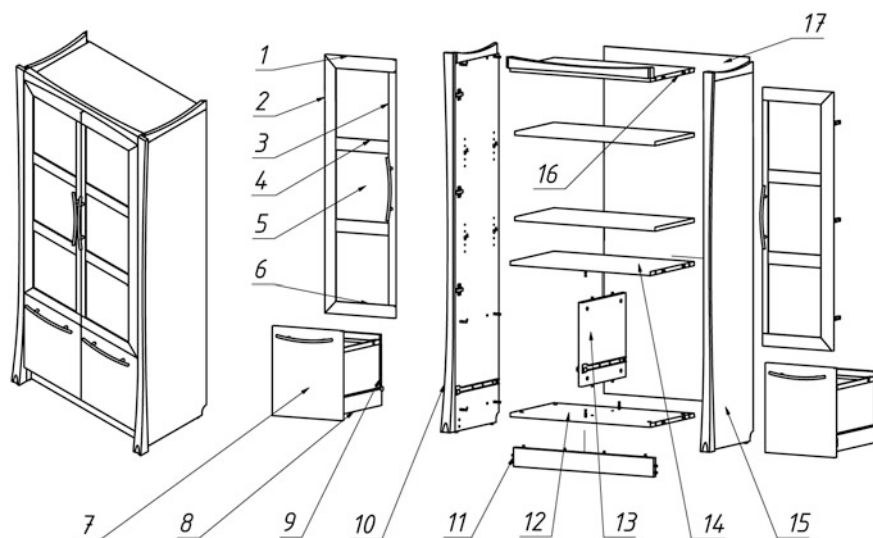


Fig. 2.23 Names of elements of case furniture—library: 1 top transverse rail, 2 left longitudinal rail, 3 right longitudinal rail, 4 central transverse rail, 5 panel, 6 bottom transverse rail, 7 front of the drawer, 8 side wall of the drawer, 9 rear side of the drawer, 10 laminated board, 11 socle skirt, 12 bottom, 13 vertical partition, 14 horizontal partition, 15 side wall, 16 top, 17 rear wall

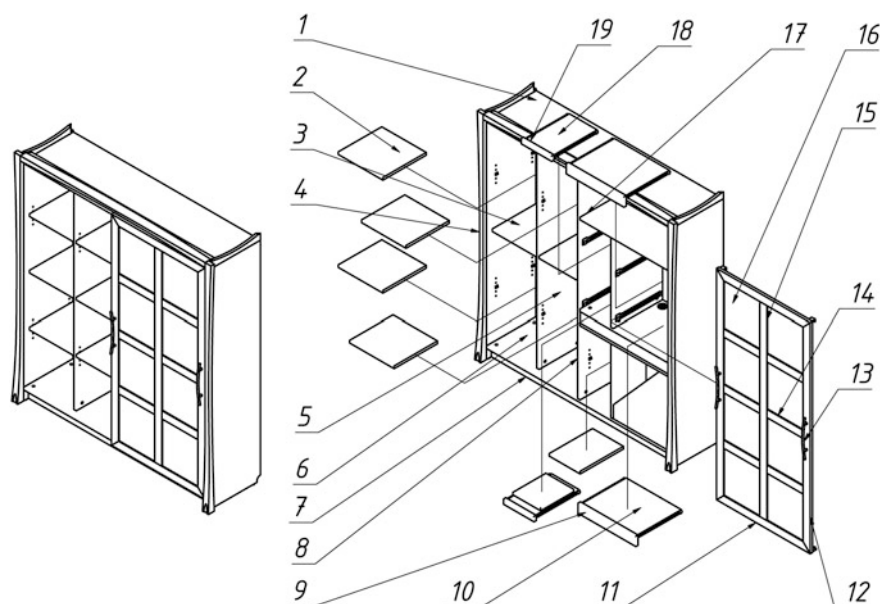


Fig. 2.24 Names of elements of case furniture—wardrobe: 1 top, 2 shelf, 3 horizontal partition, 4 laminated board, 5 vertical partition, 6 bottom, 7 laminated bottom board, 8 vertical partition, 9 front of the slide, 10 slide, 11 bottom transverse rail, 12 right longitudinal rail, 13 handle, 14 central transverse rail, 15 central longitudinal rail, 16 panel, 17 horizontal partition, 18 slide, 19 front of the slide

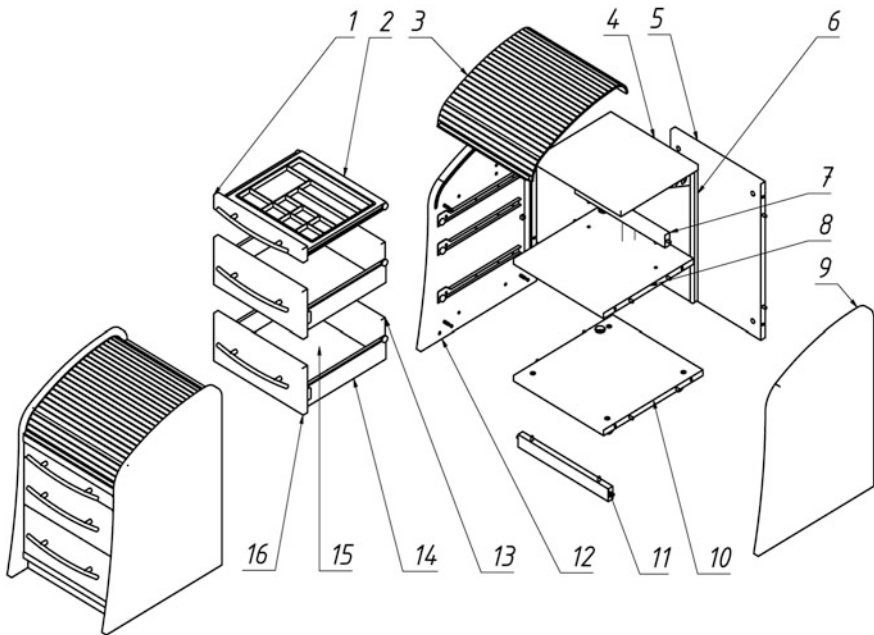


Fig. 2.25 Names of elements of case furniture—container: 1 front of the case, 2 case, 3 blinds, 4 top, 5 rear wall, 6 partition wall, 7 skirt, 8 horizontal partition, 9 right side wall, 10 bottom, 11 socle skirt, 12 left side wall, 13 rear wall of the drawer, 14 side wall of the drawer, 15 bottom of the drawer, 16 front of the drawer

- door, a movable element with a vertical axis of rotation, which closes the furniture piece. Depending on the direction of opening, distinguished are right doors—opened to the right—and left doors—opened to the left, and in special cases, it may be a subassemblage,
- sliding doors, a movable element shifted horizontally, which closes furniture piece,
- flap door, door lowered down, in other words, doors with a horizontal axis of rotation,
- strip, the element that complements basic construction, acting as a slider, supporter, resistant, connector, etc., depending on the function it might be a sliding strip, skirting, ring beam strip, thickening strip, closing trim, bearing strip, supporting strip, etc.,
- leg, the bearing element of the base of furniture, depending on the location in the unit it may be a front or rear leg,
- panel, the plate element filling the space between the rails of the frame,
- worktop, the element or subassemblage that constitutes the usable, top plane of the furniture,
- bottom gantry and top gantry, the element that constitutes a slider of drawers in case and skeletal furniture,

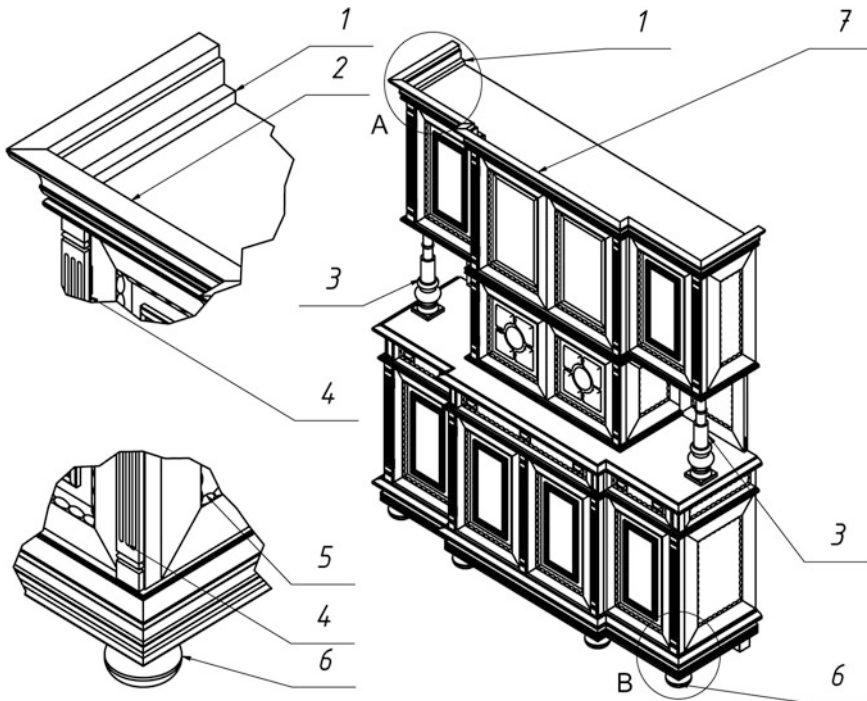


Fig. 2.26 Names of elements of case furniture—dresser: 1 transverse rail, 2 longitudinal rail, 3 post, 4 decorative strip, 5 quarter round, 6 leg, 7 longitudinal rail

- thickener, the complementing element, mainly of compensatory, reinforcing and decorative character,
- shelf, loosely arranged horizontal board element for placing various objects,
- runner, the strip element, sometimes specially profiled to slide drawers, projectors, etc., and depending on the location there are top, lateral and bottom runners,
- vertical partition, an element which constitutes a fixed vertical division of parts of space in case furniture,
- horizontal partition, an element which constitutes a fixed horizontal division of space in case furniture,
- rail, the component element of the frame, and depending on the location, there are longitudinal, transverse, central rails, etc.,
- post, the element that constitutes vertical reinforcement or filling in the base or the body of the unit,
- side wall, an element which is the fixed side exterior limitation of the case furniture piece, and in special cases, it may be a subassemblage,
- partition wall, an element which is a fixed vertical separation of the entire space in the case furniture piece,

- front wall, an element forming a fixed front outer limitation of the case furniture piece,
- rear wall, an element forming a fixed rear outer limitation of the case furniture piece,
- wall, an element forming a fixed outer limitation of the assemblage or subassemblage acting as a container, e.g. a drawer or container for bedlinen,
- depending on the position, there are side, front, rear walls, etc.,
- seal, a compensatory element made of wood, rubber or other material,
- bottom (bottom flange for flange structures), an element which is the fixed outer bottom limitation of the body of the case furniture piece,
- top (top flange for flange structures), an element which is the fixed outer top limitation of the body of the case furniture piece and
- slide, a movable element which provides an additional worktop when pulled out.

Subassemblages and assemblages include (Figs. 2.27 and 2.28):

- side, subassemblage constituting a side limitation,
- socle, subassemblage consisting of a bottom and at least 3 interconnected socle skirts, which is a type of base in the case furniture,
- body, subassemblage consisting mostly of structurally bonded side walls, bottom, top and rear wall, constituting the bearing structure of the furniture or assemblage of case structure,

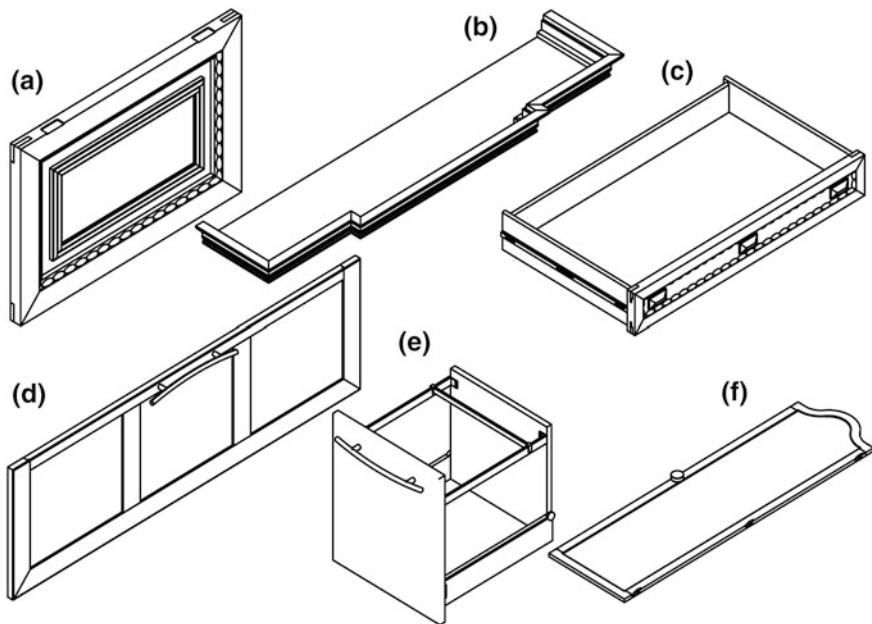


Fig. 2.27 Names of subassemblages of case furniture: a, d, f frame panel door, b top, c, e drawer

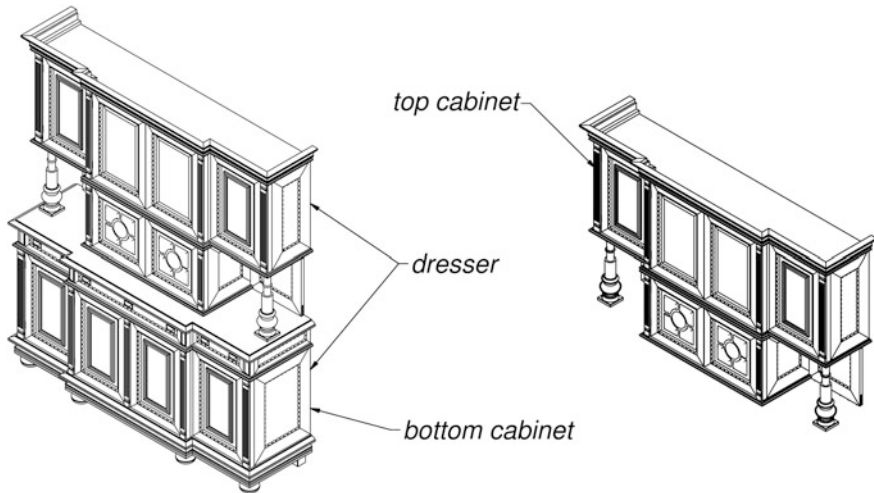


Fig. 2.28 Names of assemblages of box furniture

- base, an assemblage or subassemblage that has a bearing function for the furniture piece or assemblage,
- frame, subassemblage consisting of connected rails, e.g. door frame,
- chest, assemblage fulfilling the function of a container,
- base frame, subassemblage of a skeletal structure which is a kind of base,
- cabinet, an assemblage fulfilling the function of a container, e.g. desk cabinet and davenport cabinet,
- drawer, subassemblage which is a movable container, open at the top and
- blinds, subassemblage for closing a case furniture piece by drawing, flexible (bendy) in the direction of motion.

2.4 Characteristic of Skeletal Furniture

Skeletal furniture is the products of linear and surface structure, in which elements do not close a space. Like in the group of case furniture, we distinguish:

- main element, forming the function and construction of the furniture piece (leg, backrest board, seat frame, top panel—usually the worktop of the table),
- complementary element, providing only the function of furniture piece (insert of worktop, armrest) and
- compensatory element, which can improve satisfactory stiffness, strength, durability and reliability of construction (support, bar).

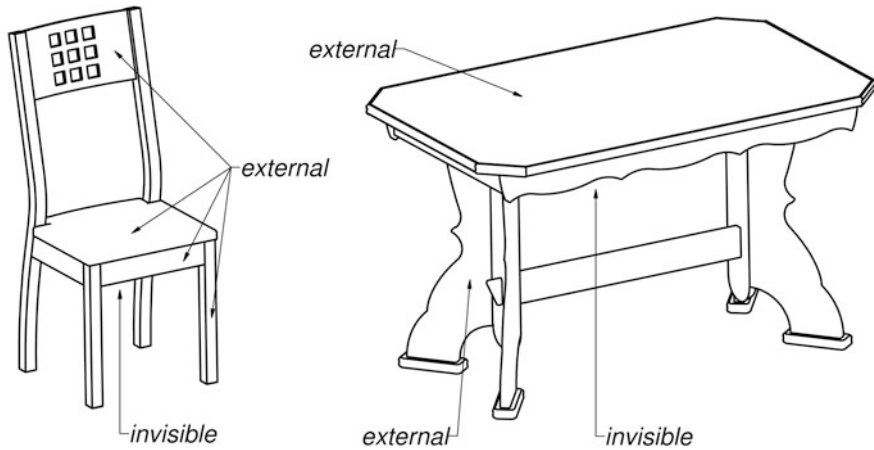


Fig. 2.29 Types of surfaces in a skeletal furniture piece

Each of these elements can be made as:

- beam or rod element derived from wood, or any profile made of metal or plastic,
- element in the form of a board made of wood or fitting made of metal or plastic and
- panel element, obtained from an MDF board, HDF board, composite board with the addition of lignocellulosic particles, plywood, etc.

Usually, skeletal furniture consists of a frame (i.e. a skeletal bearing structure), the seat and the backrest (in the case of chairs), as well as of the top panel (in the case of a table, it is usually a worktop). Characteristic surfaces of these parts significantly affect diversity of finish and workmanship. Distinguished here are (Fig. 2.29):

- external surfaces, visible in the furniture piece at a position of use. This includes all surfaces of beam, rod, board and panel elements and
- invisible surfaces, those that are invisible in the furniture piece during its use in accordance with the intended purpose. This includes bottom surfaces of seats, worktops, invisible surfaces of rails, frames and runners.

The most characteristic representative of skeletal furniture is the chair. Usually, frame elements (of bearing structure) of chairs are connected using inseparable connections, which provide greater stiffness and strength of the construction compared to connections using metal joints (bolts and screws for wood) (Fig. 2.30).

The seats of chairs usually constitute a separate subassembly, but they may well be a constituent element of the frame. Depending on the purpose, the seats of chairs are made in upholstered form, from plywood and plastic mouldings, flat or profiled boards, leather, wicker or rattan weaves (Fig. 2.31).

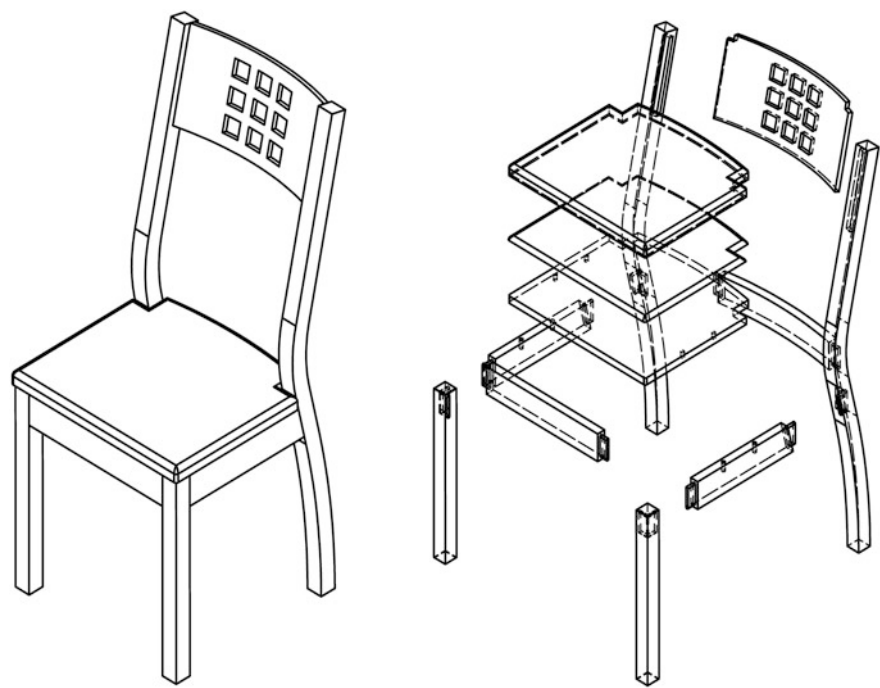


Fig. 2.30 Bearing structure of the chair

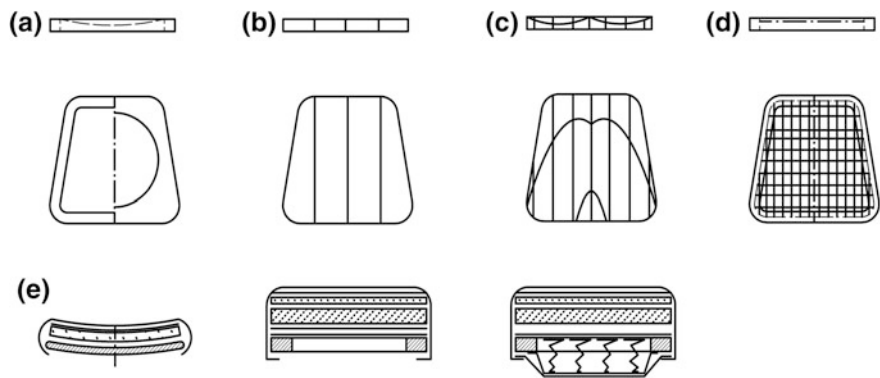


Fig. 2.31 Examples of constructions of seats: **a** plywood, **b** straight wood panel, **c** profiled wood panel, **d** woven, **e** upholstered

The backrest of a chair, similarly to the backrest of an armchair, ensures additional transfer of the human body's weight. It usually constitutes the form of connection of backrest legs. There are also backrests that are an independent element or subassemblage fitted to the seat (in stools), frames (in bent furniture) or to

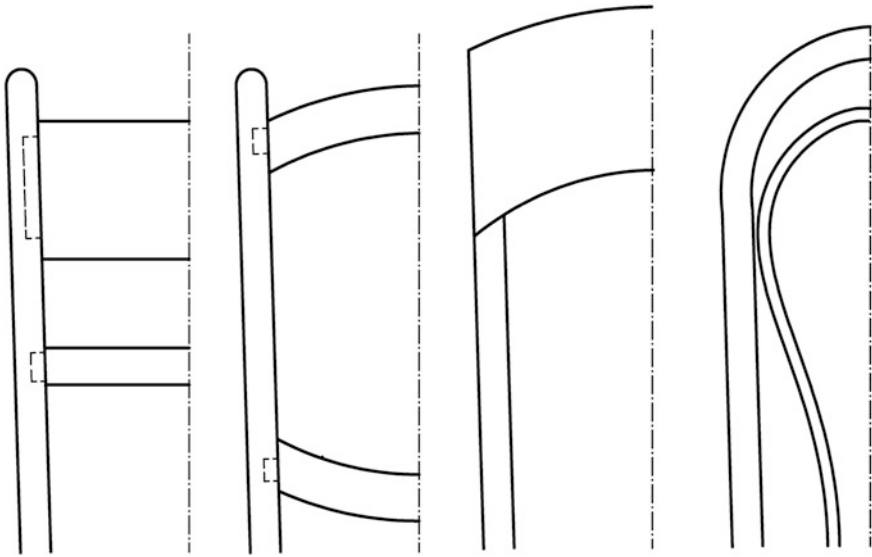


Fig. 2.32 Examples of backrests of chairs

the rails (in carpentry furniture) (Fig. 2.32). As in the seat, depending on the purpose of the chair, the filling between the vertical elements of the backrest are made in upholstered form, made of plywood and plastic mouldings, flat or profiles boards, leather, wicker or rattan weaves.

Tabourets and benches are a kind of skeletal furniture mostly used in kitchens and public buildings. These are usually constructions without a backrest; however, due to ergonomic reasons, for benches for waiting rooms in public offices, backrests are designed which support the entire back or only a portion at the height of the loin (Fig. 2.33). Like with chairs, the seats of tabourets and benches can be hard or upholstered.

The shape and detailed features of tables depend on the place of use. For each specific group of users in kindergarten, school, office, laboratory, computer laboratory, dining room, kitchen, restaurant, etc., often personalised parameters are defined, which decide on the shapes, dimensions and construction solutions. In tables intended for flats, the height of the top surface is adapted to users sitting on chairs. In places of recreation and leisure, low tables are designed, called occasional tables, tailored to people sitting in armchairs.

Bearing structures of high tables occur mainly in rail forms (Fig. 2.34), with the legs of the following cross sections: polygonal, rectangular, triangular, circular, oval and irregular. In longitudinal cross sections, the legs have rectangular or trapezoidal shape, usually converging downwards. For transport reasons, it is recommended that the legs are attached to the rails in a disjoint manner.

Depending on the purpose and functions of the designed table, the top boards can have a regular form of squares, rectangles, ellipses, ovals and circles, or in the

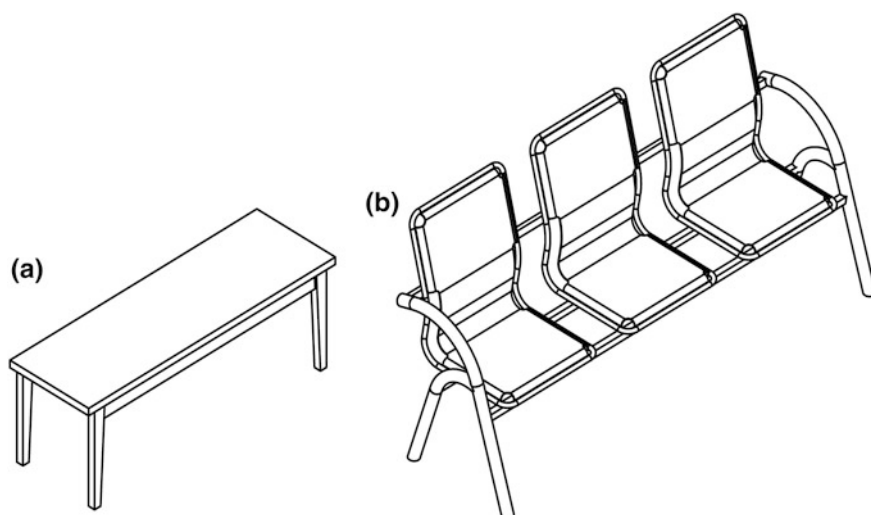


Fig. 2.33 Examples of constructions of benches: **a** from wood, **b** from metal

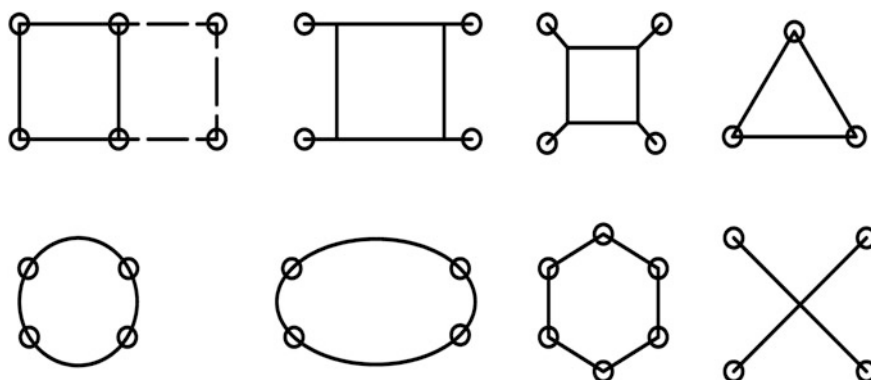


Fig. 2.34 Examples of the shapes of rails

form of irregular surfaces limited by a polygon, spline or polyline. In employee table for offices, designers search for shapes of top surfaces which allow their connection into new usable forms (Fig. 2.35).

Each of the shapes of the top surface should enable its pivoting, rotating, pulling out and disassembling. In addition, in school and office furniture, it is important to provide the possibility of step or stepless height adjustment of their position.

Top surfaces of tables can be made entirely from solid wood, chipboard, carpentry boards, cellular and MDF boards, boards veneered with natural veneer, decorative paper, HPL, CPL laminate, as well as metal and plastics. There are also boards made of plastic, marble, glass or a few materials simultaneously, e.g. metal

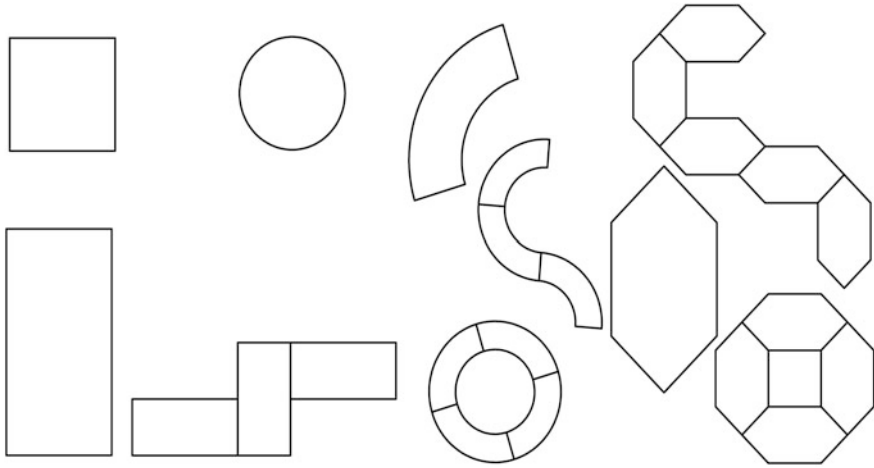


Fig. 2.35 Examples of the shapes of top surfaces of tables and possibilities of their connection

and glass, wood and ceramic tiles, wood and glass, etc. Depending on the purpose, worktop surfaces should be finished with materials of varying durability and resistance to the impact of fluids, temperatures, UV radiation, mechanical damage, etc.

From the point of view of use, tables of variable surface of the worktop are favoured. According to Swaczyna and Swaczyna (1993), they can be divided into three groups:

- with an increased working surface,
- with a lifted working surface (board) and
- unfolding or connected tables.

Among tables with an increased worktop, Swaczyna and Swaczyna (1993) distinguish tables with:

- moving boards supported after being unfolded on pulled out legs,
- moving boards supported on extended rails,
- sideboards supported on additional supports and
- boards enlarged using auxiliary boards (inserts).

Tables with movable boards supported after extended on pulled out legs are characterised by the mobility of the structure of the frame, generally thanks to fitting wheels. Legs with a pull-out function are attached to the rails by hinges. Worktops of these tables can be divided into two or three parts and also joined by hinges from the bottom surface. The worktop divided into two parts leans on a turntable set on the rails. In order to increase the usable area, the legs must be pulled out (usually at an angle of less than 90°), the worktop turned by 90° , and one wing of the worktop spread out (Fig. 2.36a). If the worktop is divided into three parts, then its vertical parts should be raised to a horizontal position and the legs pulled

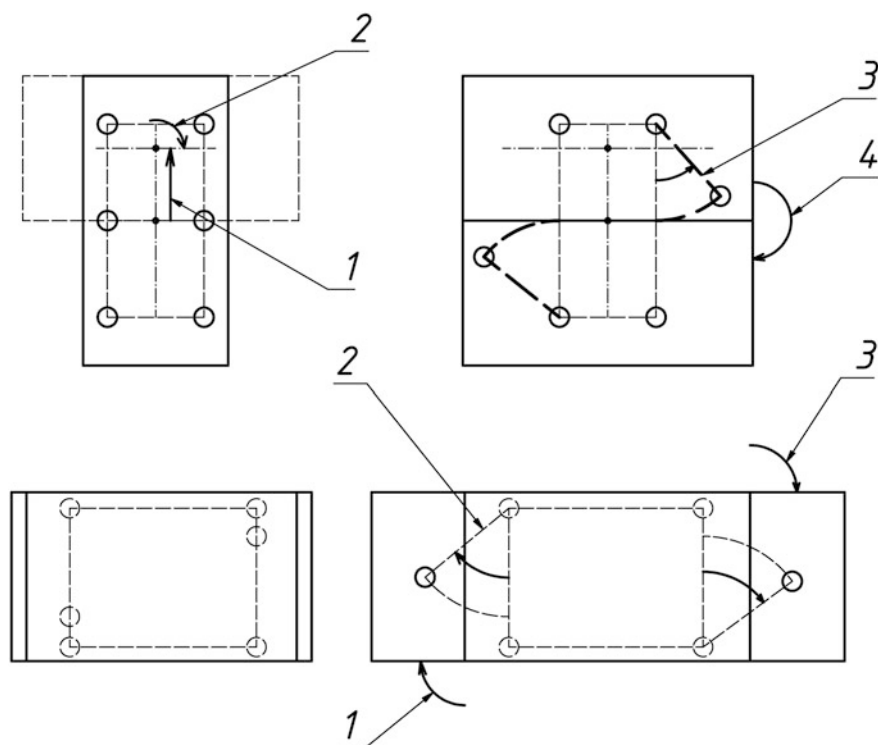


Fig. 2.36 Tables with movable worktops supported after unfolding on pulled out legs: **a** two-piece board, **b** three-piece board; 1, 2, 3, 4—sequence of actions when unfolding the table

out (Fig. 2.36b). These types of constructions are applied to kitchen tables and small dining rooms.

Tables with movable boards supported on extended rails can have divided worktops and ones connected with hinges, as well as inserts. A characteristic feature of this group of furniture is the extended construction of the rails.

In divided worktops, they rest directly on rails or on the turntable fitted to the rails. Tables with inserts are distinguished by two worktops secured to the extended rails. In order to increase the usable area of the table with an unfolded worktop, the frame must be extended and the board spread out by turning the top element 180° (Fig. 2.37a) or by turning and spreading out the upper wing (Fig. 2.37b). If the worktop of the table is assembled of two parts and fixed to the rails, user should spread out of the worktop, take out inserts and the stabilising elements from a pocket and slide worktop back again. (Fig. 2.37c). These types of constructions are applied to kitchen furniture and dining rooms.

Tables with sideboards supported on additional supports are characterised by external invariability of the geometry of the frame. Increasing the usable surface of the worktop usually occurs through the elevation of its vertical parts to the

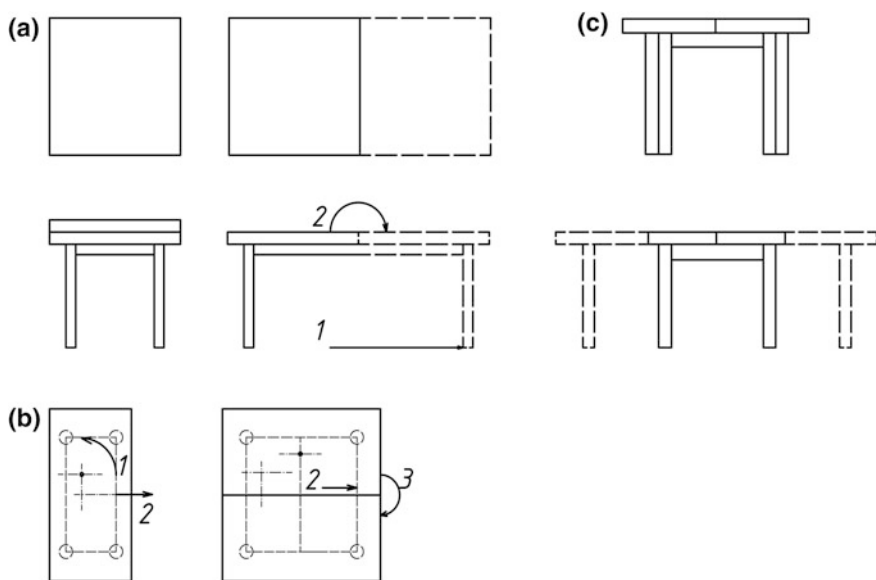


Fig. 2.37 Tables with moving boards supported on extended rails, **a** two-piece board, **b** two-piece board—turning, **c** two-piece board with inserts; 1, 2, 3—the sequence of actions when unfolding the table

horizontal position and extending the vertical supports being movable elements of the rails (Fig. 2.38a) or extending additional worktops resting under the surface of the main board (Fig. 2.38b). With this construction solution, auxiliary worktops are fixed to supports which are also runners enabling to hide and pull them out.

Tables with worktops enlarged by inserts are distinguished by: two equal sliding worktops and usually geometrically unchangeable frame. Enlarging the surface of the worktop takes place by sliding out worktop that is fixed to runners (wooden or metal) and inserting into the gap inserts in the shape of a rectangle. Inserts can be placed loosely in a magazine created in the space between the lower surfaces of the worktop and the transverse skirtings fastening the longitudinal rails (Fig. 2.39a). An interesting solution is also the eccentric fastening of the insert (Fig. 2.39b). After extending the worktops, the insert rotates 180° in the rails and again connects the

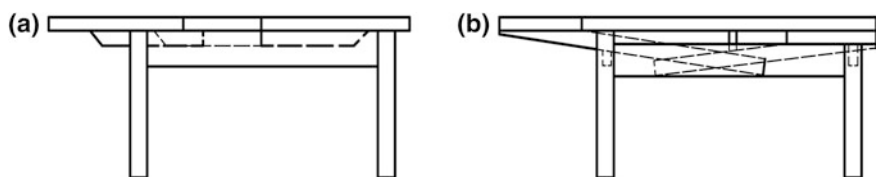


Fig. 2.38 Tables with sideboards supported on additional supports: **a** two-piece board, **b** auxiliary worktops

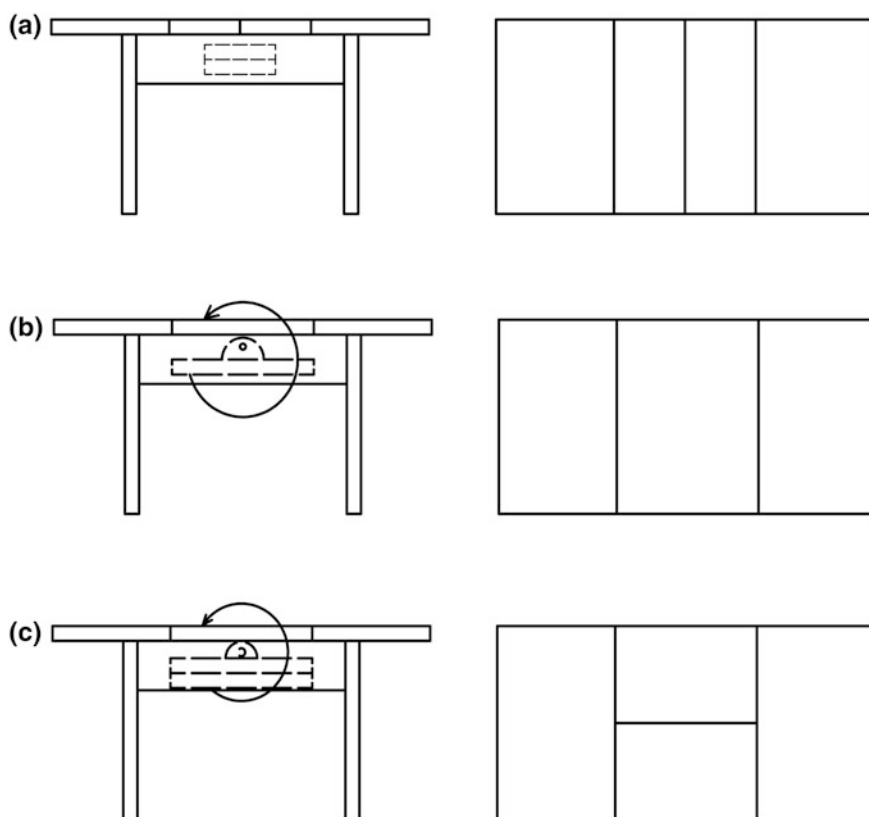


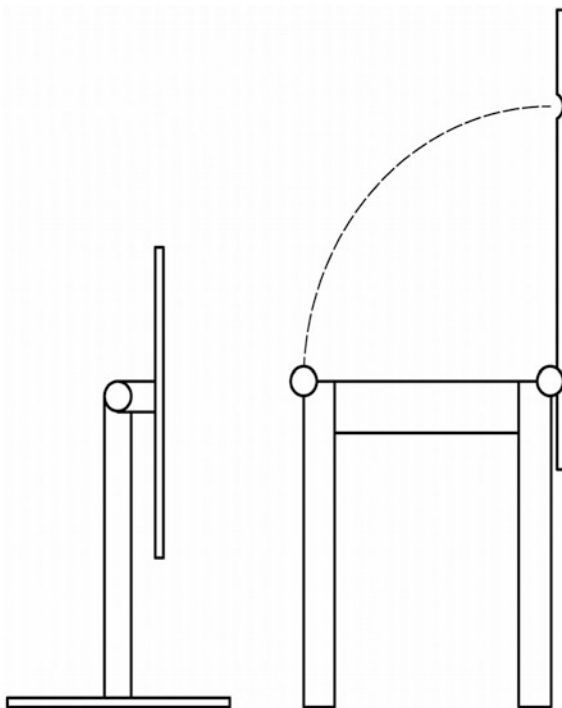
Fig. 2.39 Tables with boards enlarged using auxiliary boards (*inserts*): **a** loose inserts, **b** inserts on the eccentric joint, **c** inserts on the eccentric joint and with a turntable

worktops. At the eccentric embedding of the insert, it is recommended also to install a turntable which enables to install an insert divided into two parts, thus significantly increasing the work surface (Fig. 2.39c). With this construction solution, after extending the boards, the insert should be rotated once 180° and then the upper element of the board unfolded 180° , after which the worktops should be connected together.

Tables with an unfolded worktop are rare today. Worktops of these tables are one piece and rotationally fixed to the column or one edge of the frame (Fig. 2.40).

Unfolding or connected tables are usually marked by a fixed geometry of worktops and frames, and they are distinguished by low weight and mobility by fixing wheels to the legs. Such a construction of tables enables the quick and efficient completion of furniture and adapting rooms (usually offices) to the user's needs.

Fig. 2.40 Tables with an unfolded worktop



The following elements are distinguished in skeletal furniture, chairs and tables (Fig. 2.41):

- backrest board, an element of skeletal furniture for sitting, constituting the backrest or base for upholstering in the backrest,
- seat board, an element of skeletal furniture for sitting, constituting the seat or base for upholstering in the seat,
- hanger head, a rolled or sharp-edged element, constituting the co-axial extension of the hanger post,
- hanger hook, an element, usually formed in the shape of the letter J or S, constituting the basic functional part of the hanger,
- block, an element which is the strengthening of the main structural nodes
- and fulfils functions, e.g. of slider and resistance,
- connector, a type of curve-shaped bar in bent furniture,
- bar, an element constituting additional strengthening of structural connections, and depending on the location in the furniture piece, the bar may be longitudinal, transverse, etc.,
- leg, bearing element of the base of the furniture piece, and depending on the location in the furniture, it can be the back or front leg,
- support leg, an element fulfilling the function of a back leg and support of the backrest simultaneously in skeletal furniture for sitting,

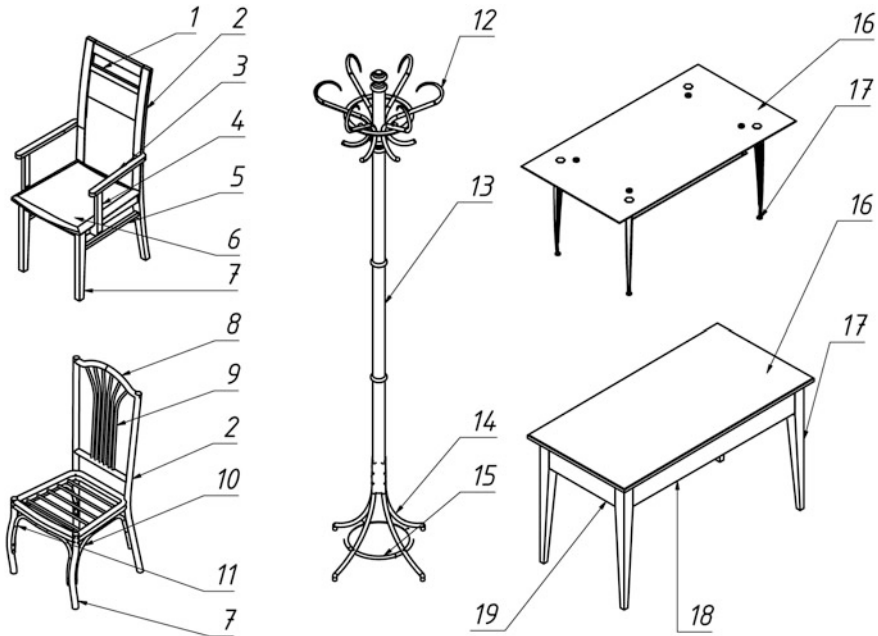


Fig. 2.41 Elements of skeletal furniture: 1 backrest board, 2 support leg, 3 armrest, 4 armrest support, 5 bar, 6 seat board, 7 front leg, 8, 10, 11 arch, 9 filling, 12 hanger hook, 13 column, 14, 17 leg, 15 rim, 16 worktop, 18 longitudinal rail, 19 transverse rail

- support legs, an bent element in the shape of an inverted U, and these are two support legs connected from the top in bent furniture for sitting,
- rim, a bent element with a closed circumference, usually constituting additional strengthening of construction connections in the base of skeletal bent furniture,
- rail, an element constituting the primary horizontal structure of the base in skeletal furniture, and depending on the location in the furniture, the rail may be frontal, side, rear, longitudinal or transverse,
- arch, a bent element in one or a few planes of an open circumference, usually constituting strengthening of connections at the base of bent skeletal furniture,
- worktop, the element or subassemblage that constitutes the usable, top plane of the furniture,
- support, an element supporting the armrest in skeletal furniture for sitting,
- armrest, an element constituting the support of arms in skeletal and upholstered furniture for sitting,
- semi-rim, a bent element with an open circumference, in the shape of the letter U, usually constituting the strengthening of connections at the base of bent skeletal furniture,
- rail, the component element of the frame, and depending on the location, there are longitudinal, transverse, central rails etc.,
- column, a vertical bearing element, e.g. of a free-standing hanger,

- muntin, an element for filling a particular space in an openwork manner
- in skeletal furniture,
- insert, a movable element for increasing the dimension of the worktop (Fig. 2.39) and
- inset, an element that fills the space between the rails and other external limitations of the backrest, side, etc., in an openwork manner, and depending on the location, there are backrest insets, side insets, etc., and in special cases, it can be a subassemblage.

Subassemblages and assemblages of skeletal furniture include (Fig. 2.42):

- side, subassemblage constituting the side limitation, and depending on the type of furniture distinguished are chair sides and armchair sides,
- backrest, an assemblage or subassemblage, upholstered or not, serving as a backrest,
- rail module, an assemblage of several rails joined together,
- base, an assemblage or subassemblage that has a bearing function for the furniture piece or assemblage,
- armrest module, in skeletal furniture usually built from an armrest and support,

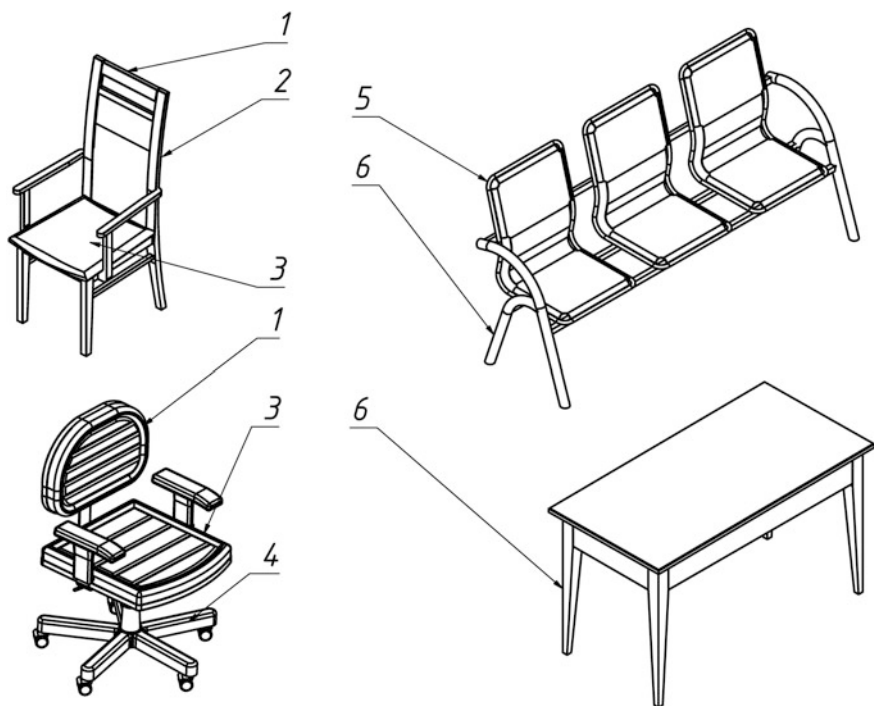


Fig. 2.42 Names of subassemblages of skeletal furniture: 1 backrest, 2 side frame, 3 seat, 4, 6 frame, 5 seat backrest subassemblage

- frame, subassemblage consisting of connected rails, fulfilling the bearing function for the upholstery pillow, also in the base or body of the furniture, and in bent furniture, it can constitute a bent element with a closed circumference, and depending on the function, there are upholstery frames, door frames, etc.,
- seat frame, a bent element with a closed circumference or U-shaped, which constitutes the main structural connection of the seat,
- seat, an upholstered assemblage or subassemblage for sitting,
- frame, subcomponent of a skeletal structure which is a kind of base
- in case furniture and skeletal furniture,
- skeleton, an assemblage or subassemblage composed of structurally bound beam elements, rod elements, pipe elements, etc., which constitutes the bearing structure of the skeletal furniture or its part, e.g. upholstered.

2.5 Characteristic of Upholstered Furniture

Upholstered furniture belongs to a group of products of complex structure and a multifaceted manufacturing process. In the designed and used interior, furniture fulfils two main functions: usable, ensuring comfortable relaxation, recreation, sleep, etc., and aesthetics connected with enriching the decor of the room.

Upholstered furniture is products of linear, surface and volume structure. Among the large group of elements of an upholstered furniture piece, we distinguish:

- main element, without which the furniture piece cannot provide the necessary stiffness, strength and reliability (e.g. the rail of an upholstery frame),
- complementary element, without which the product does not meet the expected usability functions (e.g. the foam insert of the seat, the bottom of a container) and
- compensatory element, which can improve the quality of the bearing structure (e.g. an additional rail of the frame, additional supports and bars).
- The main elements can be made of:
- boards: chipboard, carpentry, MDF, HDF, cellular, composite with the addition of lignocellulosic particles, plywood, etc., and
- wood, metal and plastics.

Complementary elements are made of:

- natural raw materials (straw, seagrass, coconut fibre, wool, feathers, horsehair, etc.),
- elastomers (polyurethane, polypropylene), latex, and silicone and
- elastic units, and pneumatic and hydraulic units.

Compensatory elements, like main elements, can be made of:

- boards: chipboard, carpentry, MDF, HDF, cellular, composite with the addition of lignocellulosic particles and plywood, and
- wood, metal and plastics.

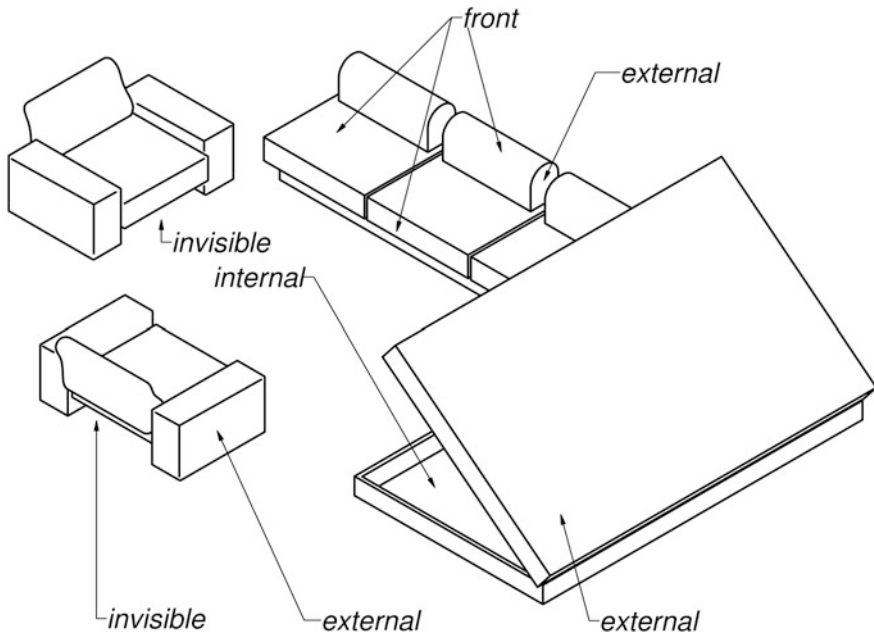


Fig. 2.43 Types of surfaces in an upholstered furniture piece

As a rule, an upholstered furniture piece consists of a skeleton glued over with foam, a permanent (or movable) subassemblage of the seat, backrest or bed and sewn cover. Each of these parts has characteristic surfaces, which position and visibility, in terms of the user, enable to diversify the finish and construction quality. Here, we can distinguish the following surfaces (Fig. 2.43):

- **front**, visible in the furniture from the standard position of use, like the surfaces of a seat, backrest and sides, with which the user comes into contact directly, as well as wooden finished surfaces of the frame,
- **external**, visible in the furniture like in the previous usable position, however with the difference that the user does not come into contact with these surfaces directly, e.g. the back surface of the backrest, external surfaces of the sides and armrests, sides. These surfaces are finished with coordinates, i.e. materials of identical colour as the front surfaces, but of lower quality and lower price,
- **internal**, visible in the open furniture piece at a normal position of use. These include surfaces of couch cases and containers for bedlinen and
- **invisible**, invisible in the furniture piece at a normal position of use. This includes all surfaces of covered frames and partially upholstered frames.

The seat or bed is fixed permanently to the rack, which constitutes the subassemblage of an upholstered furniture piece; however, when these parts are movable, in the form of pillows, then they are called assemblages. Naturally, such assemblages,

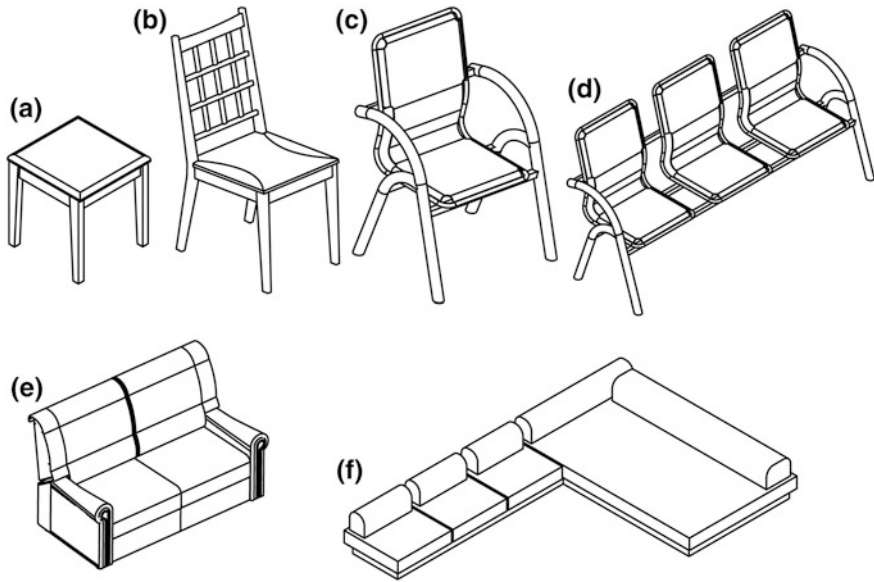


Fig. 2.44 Upholstered furniture is designed for sitting: **a** tabouret, **b** chair, **c** armchair, **d** bench, **e** sofa, **f** corner sofa

from a commercial point of view, can be stand-alone ready products, intended for separate sale.

For functional reasons, upholstered furniture can be divided into three groups:

- for sitting: tabourets, chairs, armchairs, benches, sofas, couches and corner sofas (Fig. 2.44),
- for reclining: couches, beds, lounges, chaise lounges and mattresses (Fig. 2.45) and
- for sitting and reclining: sofa, couches, sofas with a reclining function and corner sofas with a reclining function (Fig. 2.46).

The tabouret is characterised by the simplest design. In contrast, the chair has a backrest, and an armchair also has a backrest and armrest. The bench can be a simple continuation of a tabouret structure with an increased width, as well as a richly developed form of an armchair, and also with an increased width of the seat. The construction of sofas differs from the structure of armchairs only by the width of the seat and the number of persons that can use the furniture at the same time.

The most important constituent of furniture for reclining is the bed often made as an assemblage in the form of a mattress. The simplest solution is distinguished as the recliner, which does not have a container for bedlinen and with rails fitted straight to the bed. In contrast to it, the couch has a container. A bed is usually a massive frame made from wood or wood-based materials and a mattress supported on the bearing frame. Beds usually do not have containers, which is why chests of

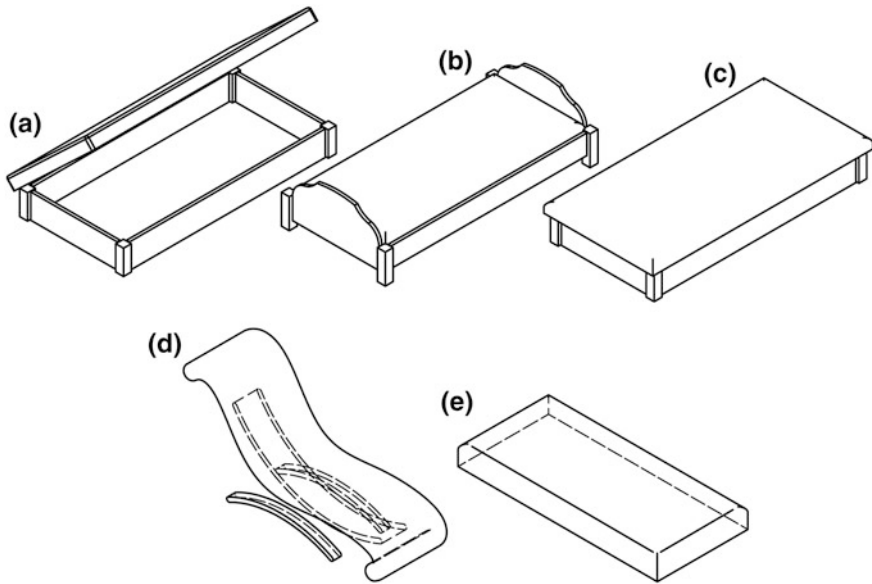


Fig. 2.45 Upholstered furniture designed for reclining: **a** couch, **b** bed, **c** lounge, **d** chaise longue, **e** mattress

drawers are placed in the bedroom. The double function of the sofa–couch, called action “couch beds”, is built from a seat and backrest joined with a container using a special lock.

In upholstered furniture, the following elements are distinguished (Figs. 2.47, 2.48 and 2.49):

- strip, the element that complements basic construction, acting as a slider, supporter, resistant, connector, etc., and depending on the function, it might be a sliding strip, thickening strip, bearing strip, supporting strip, etc.,
- connector, a type of curve-shaped bar in bent furniture,
- bar, an element constituting additional strengthening of a structural connection, and depending on its location in the furniture piece, a bar can be longitudinal, transverse, etc.,
- leg, bearing element of the base of the furniture piece, and depending on the location in the furniture, it can be the back or front leg,
- support leg, an element fulfilling the function of a back leg and support of the backrest simultaneously in skeletal furniture for sitting,
- support legs, a bent element in the shape of an inverted U, playing the role of two support legs connected from the top in bent furniture for sitting,
- armrest, a bent element with a closed circumference, usually constituting additional strengthening of construction connections in the base of skeletal bent furniture,

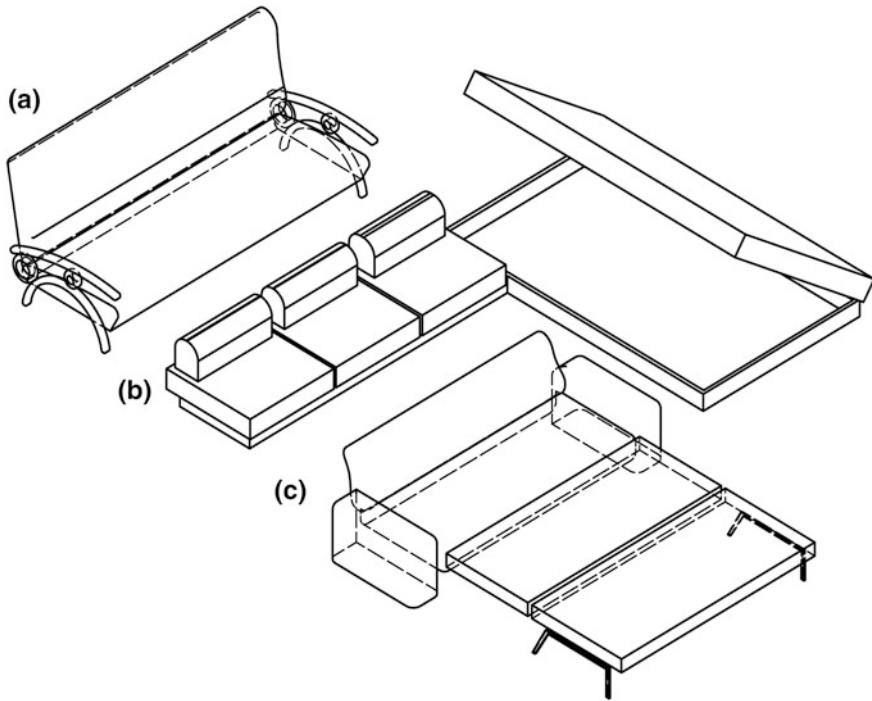


Fig. 2.46 Upholstered furniture designed for sitting and reclining: **a** couch, **b** corner sofa with reclining function, **c** sofa with reclining function

- rail, an element constituting the primary horizontal structure of the base in skeletal furniture, and depending on the location in the furniture, the rail may be frontal, side, rear, longitudinal or transverse,
- arch, a bent element in one or a few planes of an open circumference, usually constituting strengthening of connections at the base of bent skeletal furniture,
- panel, the plate element filling the space between the rails of the frame,
- support, an element supporting the armrest in skeletal furniture for sitting,
- armrest, an element constituting the support of arms in skeletal and upholstered furniture for sitting,
- shelf, loosely arranged horizontal board element for placing various objects,
- semi-rim, a bent element with an open circumference, in the shape of the letter U, usually constituting the strengthening of connections at the base of bent skeletal furniture,
- rail, the component element of the frame, and depending on the location, there are longitudinal, transverse, central rails etc.,
- post, the element that constitutes vertical reinforcement or filling in the skeleton and
- muntin, an element for filling a particular space in an openwork manner in skeletal furniture.

Fig. 2.47 Elements of upholstered furniture—armchair: 1 support leg, 2 armrest, 3 armrest support, 4 horizontal rail, 5 rail 6 front leg

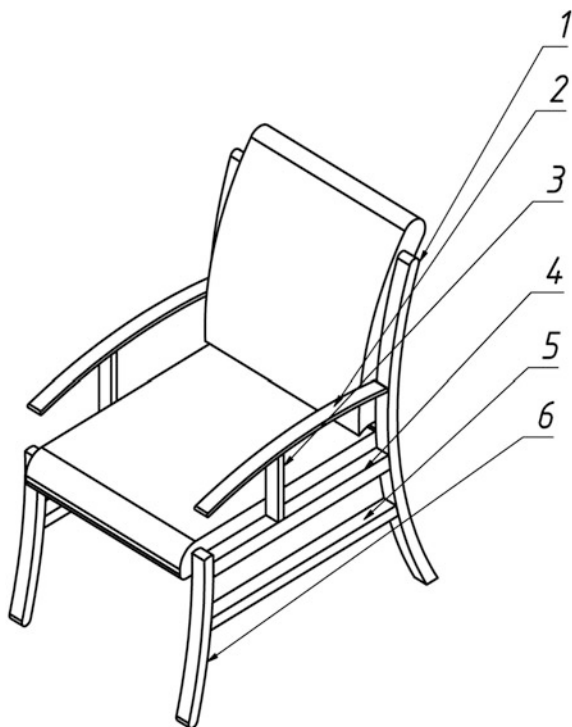


Fig. 2.48 Elements of upholstered furniture—couch: 1 mattress, 2 bedside short, 3 bottom of the container, 4 bedside long

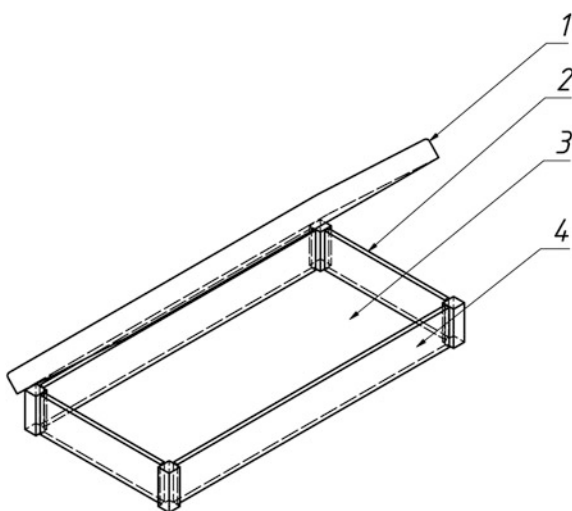
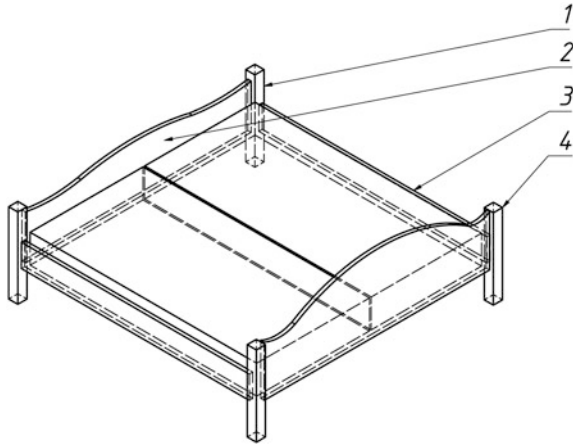


Fig. 2.49 Elements of upholstered furniture—bed:
1, 4 leg, 2 front head board,
3 bedside long



We distinguish the following subassemblages and assemblages (Figs. 2.50 and 2.51):

- side, subassemblage constituting the side limitation, often also the basis in upholstered furniture for sitting and reclining, and depending on the type of furniture, the following is distinguished: armchair side, couch side and bed side,
- bed, upholstered assemblage or subassemblage for reclining,
- mattress, type of cushion acting as a bed, the mattress can have one, two, or more parts
- backrest, an assemblage or subassemblage, upholstered or not, serving as a backrest,
- case module, an assemblage of several cases joined together,
- headrest, upholstered assemblage or subassemblage used to support the head
- in upholstered furniture for sitting and reclining,
- base, an assemblage or subassemblage that has a bearing function for the furniture piece or assemblage,
- cushion, upholstered subassemblage constituting a loosely inserted bed, seat, rest, etc.,
- armrest module, in skeletal furniture usually built from an armrest and support,
- frame, subassemblage consisting of connected rails, fulfilling the bearing function for the upholstery pillow or in the skeleton of the furniture, and in bent furniture, it can constitute a bent element with a closed circumference, and depending on the function, there are upholstery frames, side frames, door frames, etc.,
- sitting frame, a bent element with a closed circumference or U-shaped, which constitutes the main structural connection of the seat,
- seat, an upholstered assemblage or subassemblage for sitting,
- chest, assemblage fulfilling the function of a container or also the base in upholstered furniture, e.g. a chest for bedlinen,

Fig. 2.50 Subassemblages of upholstered furniture—
armchair: 1 backrest, 2 seat, 3 side frame

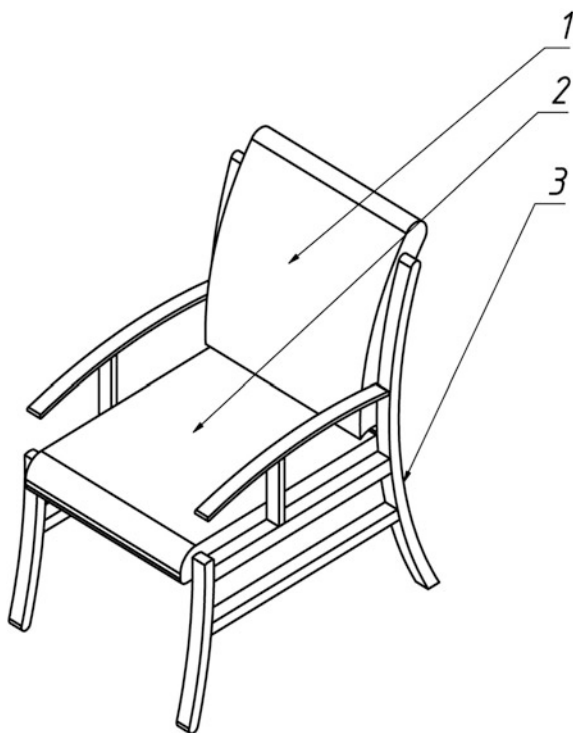
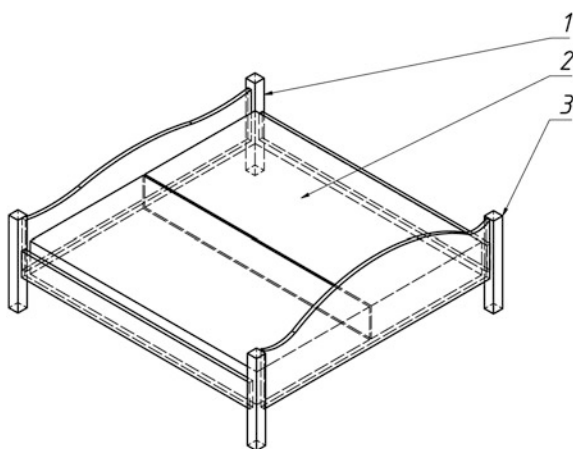


Fig. 2.51 Assemblages of upholstered furniture—bed:
1 front head, 2 mattress, 3 rear head



- frame, subcomponent of a skeletal structure which is a kind of base in box and skeletal furniture,
- front head, subassemblage constituting a fixed external constraint, most often also the base of an upholstered furniture for reclining from the side of the user's head,
- rear head, subassemblage constituting a fixed external constraint, most often also the base of an upholstered furniture for reclining—from the side of the user's legs and
- skeleton, an assemblage or subassemblage composed of structurally bound beam elements, rod elements, pipe elements, etc., which constitutes the bearing structure of the skeletal furniture or its part, e.g. upholstered.

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