

# The Design-Drawing Relationship in Small Artifacts. Practices, Reflections and Dynamics of Representation for Arthouse Handles

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## Abstract

*Between theory and practice, this work questions the nature of the handle design, the direct metric relationship between the drawn data, the one thought and, subsequently, realized; between the imaginary data, accessible in the representation, and the real one, on the modality of use of the represented data which also significantly affects the technical-configurative procedures; on the 'real' management of planning, formal and executive contents. More specifically, the article on the one hand reconstructs the story of the relationship between drawing and design through the study of the handle artifact from the Bauhaus to the present day, identifying and observing emblematic cases (arthouse handles) intended as fundamental stages in the construction of a dialogic story between project and representation in its double aesthetic and ethical value; on the other hand, it reconstructs an infographic knowledge system oriented to the visualization of design themes linked to the handle artifact through devices which take into account the dynamics of representation of the artifacts and morphological qualities towards hybrid media and narrative forms, within the framework of a research experience based on the encounter between the discipline of design and that of drawing and on experimentation strategies implemented through the methods and codes of representative language in a continuous and lively definition of disciplinary boundaries.*

*Keywords: handles, design, drawing, representation, taxonomy.*

## Introduction

Complex artifacts, the handles are configured as an interesting and little studied field of experimentation and conceptual reflection for the design project and for its representation: in their multiple interpretations of elements of completion of the architectural construction, of furnishing objects and tools, up to their value as mechanisms for opening and closing doors and windows, the handles appear to herald an approach to representation that is always different according to the specific purpose of their design, but always in an intimate relationship with the design poetics that it underlies the form and, more generally, the aesthetics.

Generally speaking, the theme of form combined with that of geometry, representation and visualization of the

artifact as well as the theory of configuration linked to the ideational principles of the project, identifies in the design of these small objects, converging in the objective of the project, the place privileged to elaborate the thought and the image that is progressively traced, until it assumes the features of concreteness and turns into matter.

From the catalogs' didactic drawings patents' executive ones, from the conceptual sketches revealing morphological and technical innovations to the metaphorical representations of renewed man-object relationships and, again, from the rigor of geometric designs organized in orthogonal projection up to the organic and fluid elaborations of 3D CAD/CAM matrix, the handles are ultimately important chapters of the twentieth century design narrative, of-

fering infinite variations in the relationship between form and representation.

### The handle design: from Bauhaus to contemporary production

Around the turn of the nineteenth and the twentieth century, in the period from 1890 to 1920, the handles are characterized by an aesthetic that expresses the union of a functional condition (opening/closing mechanism) and a decorative condition, the latter in turn attributable to two prevailing categories: the first made up of animal elements (griffins, swans, lions, etc.), the second of vegetable elements (plants, fruits, etc.), respectively expression of ancient symbolic representations and new fascinations for the places of the colonies. The forms that these conditions produce, belonging in general to the Liberty language, undoubtedly express a conscious aesthetic thought, but it is with the Detscher Werkbund before and with the Bauhaus after that the design of the handle is configured for the first time as a project theme: it is not secondary that it is a handle, specifically the one designed by Walter Gropius and Adolf Meyer in 1923, the first design object to be designed in the Bauhaus and then mass-produced industrially and sold to finance the School (fig. 1).

With the Bauhaus the aesthetics of the objects therefore changes radically because all references to the naturalistic world are replaced by those of abstract art and the world of industrial machinery: the Gropius-Meyer handle, produced in brass and nickel-plated steel by the German company Loevy, was born from a prototype designed first for the Fagus workshops in Alfeld and for the Civic Theater in Jena (both designed by Gropius and Meyer respectively in 1911 and 1922), then for Georg Muche's Horn House in Weimar (1923), up to being mass-produced for use on the interior doors of the Bauhaus building in Dessau (1925). The original version consists of a square section bar that turns between the neck and the lever, then transforming itself into a cylindrical body that constitutes the handle, whose base circumference circumscribes the size of the square of the neck (its diameter is equal to the diagonal of the latter), while the parallelepiped body mutates its attachment to the rosette through another small cylindrical element of the same width as that of the handle. Later versions, starting with those used in Dessau, are larger and have a different proportion between the

cylindrical and parallelepiped parts, including the base diameter which no longer coincides with the diagonal of the square but is larger. Until the mid-thirties, the Dessau handle was produced in about 20 versions in which the measurements and proportions between the constituent parts vary (lever length, cylindrical part length, cylindrical part diameter, parallelepiped part width), while maintaining the principle morphological-formal. Beyond his project, the story of the production of the Dessau handle is particularly significant insofar as it outlines an extremely dense and articulated picture of the industrial production realities that in Germany in the twenties and thirties, precisely through the large-scale production of components for architecture (and among these the handles), they make an essential contribution to the spread of the design culture of these years, reverberating and expanding the work done by schools and great masters. However, the Dessau handle is not the only one to influence the design of these years: other handles soon

Fig. 1. W. Gropius, A. Meyer, maniglia Dessau handle in model 3174, S.A. Loevy, 1923 (source: [www.catawiki.com](http://www.catawiki.com)).



became 'archetypal', including the Frankfurt by Ferdinand Kramer (1925) and the handles by Robert Mallet-Stevens, Ludwig Wittgenstein and Adolf Loos, all in their own way innovative with respect to current production, and all of which can be framed in an aesthetic trend, even if simplistically definable as 'geometric', which contrasts with the language of an organic matrix directly deriving from the Liberty, Arts & Crafts and Jugendstil experiences.

The overcoming of this opposition of formal languages takes place after the Second World War, first with the Ulm handle (1954) by Max Bill (fig. 2) and then thanks to the Italian experience, largely dominated by the company's productions Olivari and the figure of Gio Ponti [Casciani 1992]. If the design of the handles in this period in most cases expresses the desire to definitively move away from the formal rules of the Modern Movement, it is with Gio Ponti's Cono (1954), Anello (1954) and Lama (1956) handles that it begins to tell more explicitly an unprecedented idea of modernity based on continuity with the forms of the past, on the ideal of lightness of new objects, on the reduction of morphological complexity and on the social dimension of design, specifically intended as a reduction in the degree of formal abstraction in favor of a greater 'physical-material' relationship with the user (fig. 3). This condition continued with relative continuity until the 1990s, with some interruptions that were expressed on the one hand through a series of hybridizations of the prevailing models by virtue of the advent of new materials and new production technologies (think of plastics, nylon and resins), on the other through slowdowns in the natural aesthetic-formal evolution of the consolidated types [Bearzotti 1981; Scarzella 1982]. Starting from the early Nineties, therefore, the resumption of production, driven by the implementation of the new hot forging technique instead of die casting, if on the one hand it initiates a new process of research on the aesthetic-formal level, on the other it highlights a certain mannerism in experiences which, albeit cultured and important (think of the handles by Vico Magistretti in 1992, by Angelo Mangiarotti in 1993 and by Paolo Portoghesi in 1997) are limited to reworking or revisiting the historicized models [Casciani 2010]. A few years later the new finishing technologies,

Fig. 2. M. Bill, Ulm handle in the original drawing, 1954 (source: [www.griffwerk.de](http://www.griffwerk.de)).

Fig. 3. G. Ponti, handle Lama, Anello e Cono handles in Olivari's original catalogue, 1956 (source: [www.arredativo.it](http://www.arredativo.it)).

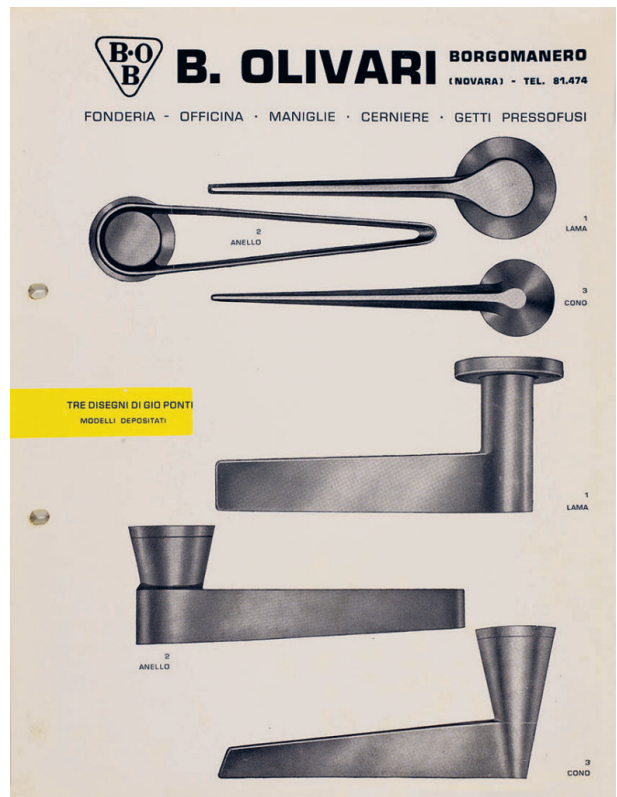
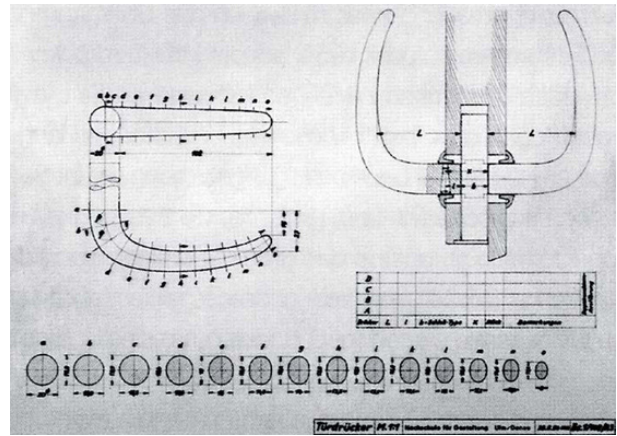
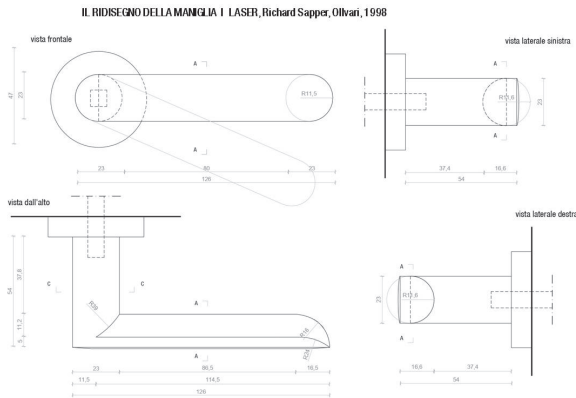


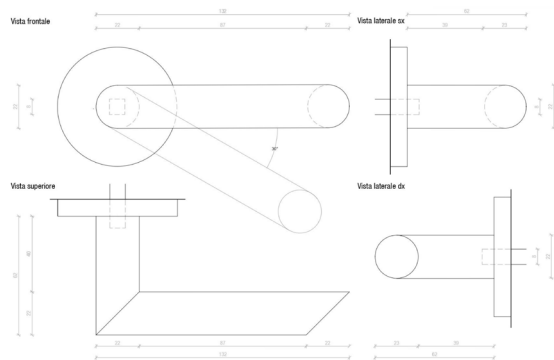
Fig. 4. E. Mari, *Stilo handle*, Olivari, 2003 (source: [www.olivari.it](http://www.olivari.it)).

Fig. 5. *Hybrid form: Richard Sapper, Laser handle*, Olivari, 1998 (graphic elaboration by the authors).

Fig. 6. *Elementary compositional actions: Shigeru Ban, Maniglia Moon*, Olivari, 2010 (graphic elaboration by the authors).



MOON, Shigeru Ban, Olivari, 2010



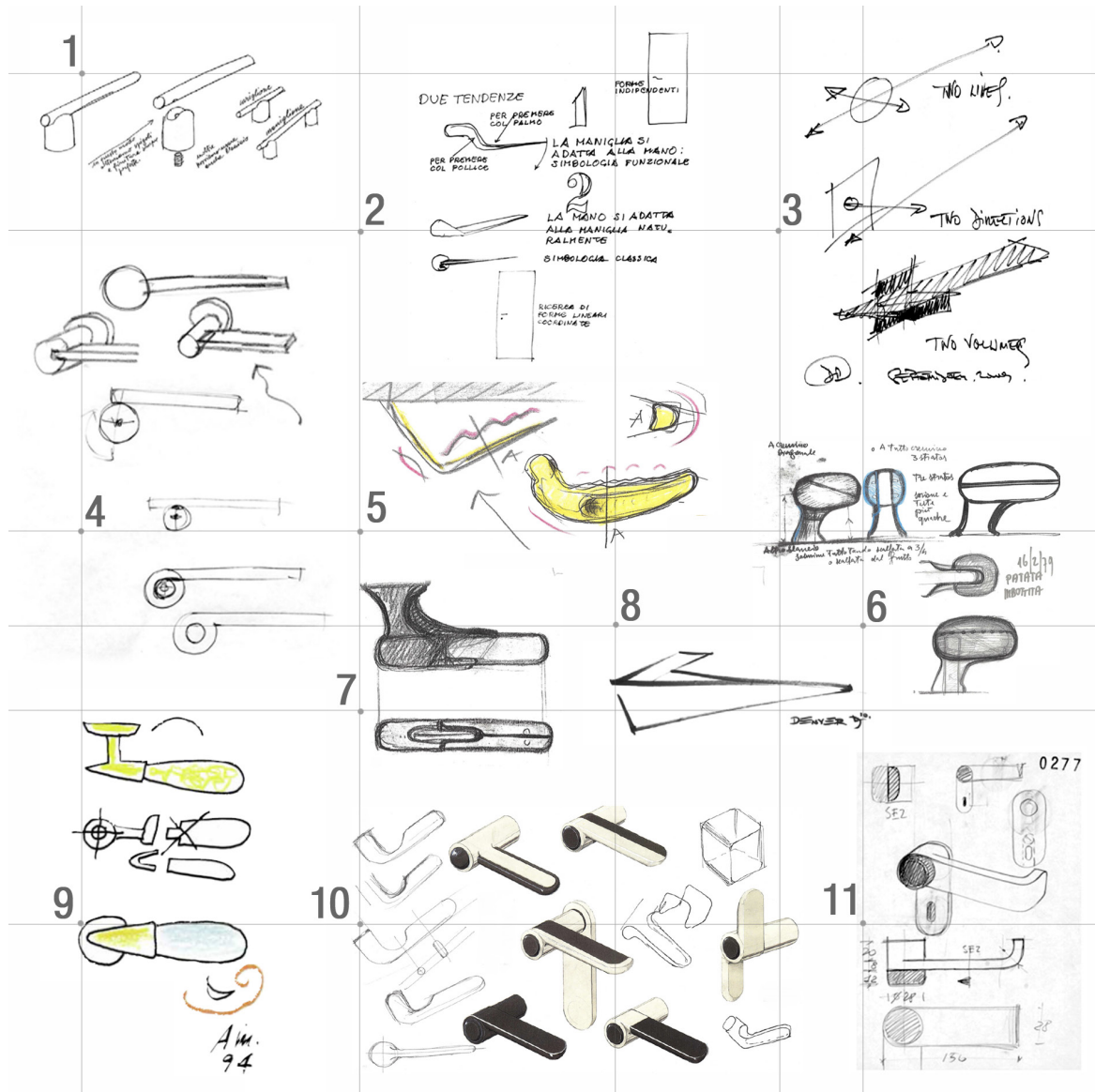
which allow greater control of knots, joints and edges (in general of all points of morphological discontinuity), open the way to greater compositional freedom by stimulating the updating of archetypal models in the direction of a renewed ethics of forms, now conceived mainly in terms of sustainability, proportional balance, dialogue with functional and productive needs, as expressed by the *Stilo handles* (2003) by Enzo Mari (fig. 4), *Space and Time* (2004-2006) by Alessandro Mendini and by the handles of Piero Lissoni, James Irvine and Shigeru Ban.

Finally, as regards contemporary production, one cannot fail to note how the trend of the latest experiments is greatly affected on the one hand by a technical research almost totally centered on the external envelope often without any dialogue with a morphological-formal dimension, on the other a new aesthetic resulting from an increasingly less tectonic control of morphology and increasingly entrusted to 3D CAD/CAM representation tools.

### The design of the arthouse handle: formal categories and taxonomies

The apparent simplicity of the handle, also betrayed by its small size, actually conceals a complexity that, as we have seen, goes beyond the peremptory dichotomous antitheses between form and function, object and tool, mechanism and furnishing element, constructive detail of architecture and minimal design object and therefore, moving within the processual triad 'design-project-production', can be analyzed through a series of parameters that are, in fact, of an exquisitely compositional-formal nature [Meccacci 2012]. By eliminating the meaning of the handle as a small sculpture or jewel to be contemplated and trying not to trace the reasons for its aesthetic-formal characterizations to merely ergonomic aspects or to specious symbolic meanings, it is possible to identify a series of categories within which to frame the different experiences of the design project of arthouse handles in order to bring them back to their most intimate nature, that is that of artefacts expression on the one hand of a synthesis between a triple condition of mechanism, morphology and tool, on the other of a balance between technical, artistic and social dimensions, in the context of a constant condition of seismographs of the evolution of our material culture [Vitta 1996].

Fig. 7. The "authorial gesture" in handle study drawings: 1. E. Mari, Stilo, 2003; 2. G. Ponti, Cono, 1954; 3. D. Perrault, Living, 2010; 4. M. De Lucchi, Tool, 2011; 5. A. Mangiarotti, Como, 1947; 6. L. Cacciadominioni, Montecarlo, 1975; 7. Cacciadominioni, Saint Roman, 1975; 8. D. Libeskind, Denver, 2009; 9. A. Mendini, Aurora, 1994; 10. Van Onck Etakeda, Tokyo, 1980; 11. J. Colomba, Paracolpi Beta, 1971 (composition by the authors).



The handles always consist of three elements: the lever, the neck and the rosette. The lever (on average between 12 and 13 cm long) is the part parallel to the door plane designed to receive the grip and the subsequent pressure of the hand; the neck (about 4-5 cm long), perpendicular to the door plane, connects the latter to the lever and contains inside a pin which activates the opening / closing mechanism; the rosette (about 5 cm wide), coplanar with the door surface, is the element which hides the connection between the neck and the door itself, hiding the movement mechanism.

The design of the handle, while showing a constant tendency to remain within one of the two macro-categories of organic shape and geometric shape (which we intend to consider here in terms of “language” to avoid anachronistic readings and reductive categorizations), is expressed through the interpretation of the morphological-formal and material relationships between these three elements, producing a series of possible configurations, which can be organized into formal categories or “themes” of design reflection, as reported, without pretense of exhaustivity or completeness, in the table which follows (table 1):

Organic language	Geometric language
<i>Morphological dimension</i>	
Unic shape-unified shape	Shape made of recognizable parts tending to unity for mounting or combination Shape made of parts obtained through de-construction, separation or analytical de-composition from a unity conceptually recognizable
Fluid shape	Shape by combination of volumes
Dynamic shape	Shape by composition of lines and planes
Plastic shape	Static shape
Ergonomic shape-which adapt to hand	Shape obtained from the reduction of components
Naturalistic shape	Simple shape
	Essential shape
	Abstract shape
<i>Technological and productive dimension</i>	
Shape expression of mechanism and functionality	Shape by configurations of nodes and joints between elements
Shape expression of artisanal constructive and/or productive principles	Tectonic shape Shape expression on industrial constructive and/or productive principles Shape by a dialogue between materials Shape by the use of new materials
<i>External dimension</i>	
Shape by the relationship between structure and ornament/decoration	Shape by the relationship between structure and envelope
<i>Semiotic dimension</i>	
Shape apparently heavy	Shape apparently light
Shape as a result of re-interpretation of traditional and/or historical models (re-design)	Innovative shape expression of the potentialities of the new information and digital technologies
Shape bearer of diachronic signs	Shape bearer of synchronic signs

Tab. 1. Themes and formal categories of the arthouse handles (elaboration by the authors).

The taxonomy set out above offers a non-exhaustive picture of the design themes and the aesthetic-figurative outcomes of the design of the handles analyzed, but in no case does it intend to close them in rigid compartments that could appear reductive with respect to the complexity of the reflections on the basis of their conception: in reality, what happens is that the models analyzed present with respect to the aforementioned categories different conditions of hybridization both in morpho-typological and aesthetic-formal terms, which places them in most cases between different categories, even apparently antithetical to each other (fig. 5). On the other hand, it may be interesting to associate this taxonomy with the system of possible compositional actions which, understood as methods of controlling the form or as strategies for achieving an aesthetic purpose (fig. 6), acquire a narrative potential with respect to the understanding of logics and reasons. at the base of the project definition processes (table 2).

Actions referred to one component element	Actions referred to two or more component elements
Compress	Match
Extrude	Connect
Tilt	Joint
Fold	Modulate
Rotate	Mount
Overlap	Shield
Cut	Overlap
Twist	Combine
Shift	Separate

Tab. 2. Taxonomy of compositional actions of the arthouse handles (elaboration by the authors).

### The handle in authorial drawing: expressive research and necessity of representation

“Between hand and tool, a friendship begins that will have no end. The one communicates its living warmth to the other and continuously moulds it. When it is new, the tool is not made, an agreement must be established between it and the fingers that grip it, formed of progressive appropriation, of light and coordinated gestures, of reciprocal habits and also of a certain wear and tear. Then the inert tool becomes a living thing” [Focillon 2002, p. 113]. This is how Henri Focillon in his essay In Praise of the Hand at the end of Life of Forms outlines the intimate

relationship of mutual influence between man and matter and how this relationship determines the shape of the tool and, in particular, the handle. This description seems to frame one of the themes addressed by the present research, which recognises in the drawing the privileged place where this relationship is manifested from the earliest ideational stages of the object. Through the sketch, a sort of 'textualisation' of the ideational language [Bistagnino 2009, p. 78] that has an important conformative role, the general lines of the project are traced, implicitly foreshadowing the final outcome. The ideational drawing, receptive to the many data and solicitations including the executive purposes, directly relates the mind and the hand, thought and its formalisation; a freehand sketch, still largely realised by means of traditional tools and supports, which, combining linguistic-representational codes with free individual expressiveness, represents and conforms the project, enucleating its spirit [Bistagnino 2009, pp. 80-82]. The study drawings of famous handles can be defined as 'gestural' sketches, graphic representations with strokes that are never instinctive, icastic, describing the artefact in essential strokes and in a dry manner, without nuances.

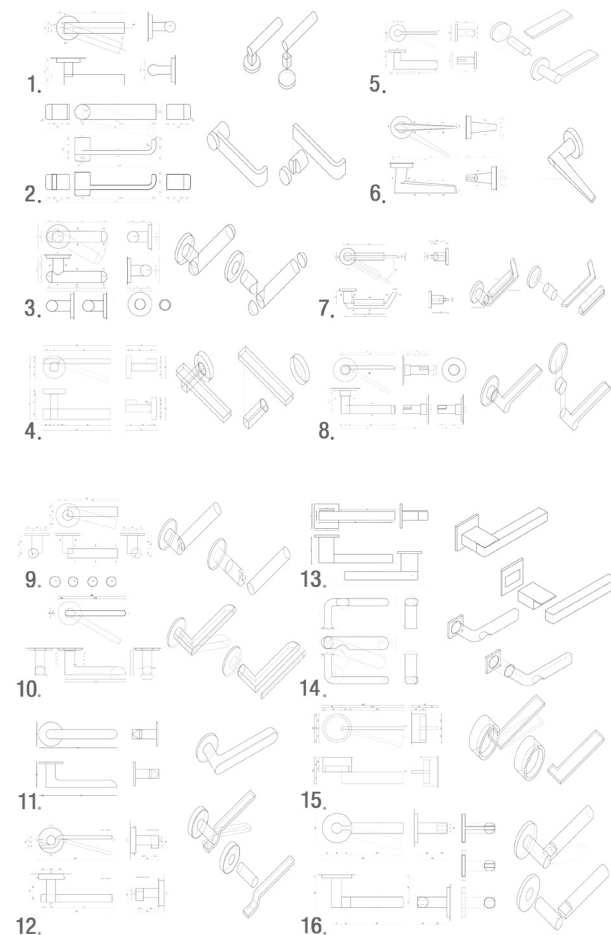
"The operation of depicting from the tracing of an outline automatically results in a simplification, a reduction to the essential" [Anceschi 1992, p. 28]. The function of such representations was defined by Anceschi himself as 'descriptive': details become less important while the emphasis is placed on the morphological aspects of the event/object [Anceschi 1992, p. 28]. In these drawings, the absence of nuances, the 'reduction of contour lines to the essential', manifest a drawing that Roberto de Rubertis calls iconic [De Rubertis 1994, p. 15] which he contrasts with 'symbolic' drawing and which for Anceschi is constructive drawing with a fundamentally operative function [Anceschi 1992, pp. 28-37].

Gesture, gripping or pressure, profoundly linked to the handle object is celebrated in the drawing defined by the outline of the shape of the lever subjected to the stress of the hand, by the lines of force exerted on the object as vectors placed in space that connect its elements, or by the profile, now in the front view, now from above, that favours the reading of possible geometries of the material, lines, closed curves and shapes that can be traced back to those codified by mathematics.

Distinctive characteristics of the handle study drawings are a "reduction to the essence and a gradual approximation to the substance" [Anceschi 1992, p. 23], which differ ac-

Fig. 8. Survey and graphical representation of Author handles (some examples) Device\_Parallel Projections: 1. H. Kolhoff, Gottardo, 2004; 2. J. Colombo, Paracolpi Beta, 1971; GPA Monti, Boma, 1972; 4. A. Mendini, Space, 2004; 5. M. De Lucchi, Tool, 2011; 6. D. Libeskind, Nina, 2012; 7. A. Castiglioni, C-1918, 2002; 8. W. Wagenfeld, W028, 1928 (graphic elaboration by the authors).

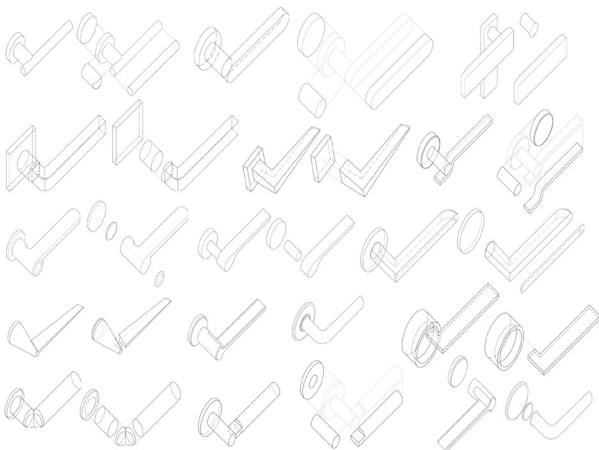
Fig. 9. Survey and graphical representation of Author handles (some examples) Device\_Parallel Projections: 9. O. Fioravanti, Boole, 2018; 10. P. Urquiola, Lucy, 2012; 11. V. van Duysen, Icona, 2018; 12. C. Boeri, Viceversa, 2015; 13. D. Perrault, Ice Cube, 2010; 14. D. Rams, DRD99, 1986; 15. M. Pisati, DND, 2022; 16. J. Pallasma, JPL16, 1991 (graphic elaboration by the authors).



ording to the expressive tension implemented by each designer; the degree of depth of the ideational process, the level of refinement of the themes addressed and the multiple representation devices used by the authors. There is little technical or construction data in these drawings, rather annotations, numbers, references to other drawings, to other objects (fig. 7).

Among the study drawings with a greater degree of detail and more advanced structural awareness are the 'visualisation drawings' [1], three-dimensional graphic models executed by hand, at the stroke, to which colour and chiaroscuro are applied, inform about the plastic component of the artefact and locate it in a more realistic expressive dimension. Sketches, conceptual and study models to life, simulations: the handle is represented and 'handled to life. Dimensional, formal, technological and constructive data are subject to direct manipulation [Bistagnino 2021, p. 30]; and this is even more true when the artefact is as small as the handle. In drawing, or what has been called the figured object [Cocchiarella 2009, p. 64], which sees the handle isolated and, in a certain way and as a result of its isolation, emphasised in form and meaning, the "management to the truth (or almost) of the design contents –formal and constructive– then determines an unexpected perceptive out-of-scale, an

Fig. 10. Survey and graphical representation of Author handles (some examples) Device \_Parallel Projections \_The axonometry (graphic elaboration by the authors).



interesting cognitive short-circuit between the imaginary datum, accessible, precisely, in the representation, and the real datum, which in addition to renewing the modalities of fruition of the represented data, also significantly affects the technical-configurative procedures" [Bistagnino 2021, pp. 30, 31].

The design material, as a flow of data (not only material, but immaterial such as ideas, tastes, perceptions, ethical values, identities and stereotypes) is organised by the drawing, "a medium of reference in the passage, direct or reverse, between the represented form and the realised form of the object" [Cocchiarella 2009, p. 64]. Through drawing, (heterogeneous) data are selected, reordered, processed and made accessible in order to construct a language capable of dialoguing with all the actors in the process of design, construction and realisation of the work.

A language, that of design drawing, which performs, in Anceschi's words, three operations. Firstly, "it *represents*, that is, it realises an evocation, or rather, it performs the work of making visible with lines, spots, strokes what the text could make visible to the mind's eye" [Anceschi 1992, p. 171]. Secondly, it "*interprets*, in the sense that it not only simply translates into images, but [...] reduces, eliminates, omits and simultaneously goes beyond the text, constructs an expansion of descriptions" [Anceschi 1992, p. 171]. Thirdly, it '*decorates*', bringing out its own artefactual character. The evocative capacity of the study sketches at the hands of the many authors encountered in the research, still makes them the most complete, exhaustive and effective means of expression. And this lies above all in the aptitude of the drawing to proceed by "successive layers, which in an alternation of overall redefinition of the form on the sheet, advancing by unbalancing and balancing in an unstable equilibrium, working simultaneously over the entire field of representation, develop and define the forms of the project. Its form oscillates between recognisable iconic elements and gestures, signs, more abstract ones derived from the writing materials and the support" [Bistagnino 2021, p. 180].

### From drawing to object. Devices of representation for the analysis of form

With a view to constructing an articulated system of knowledge to integrate the existing (and often lacking) iconographic material on the author's handles, the present study attributes to the drawing of the artefact the method



of analysing and reading the form, and to the parallel projections the descriptive space most suitable for telling them in order to organise a possible evolutionary history that better interprets the morphological, compositional and constructive characteristics together with the author's poetics.

Drawing and representing an artefact in its physical and material consistency, in its configuration as an autonomous object [Cocchiarella 2009, p. 151], together with its components, its body and its kinematics [2], is an activity no longer entrusted exclusively to the designer. Indeed, Joe Colombo predicted: "The designer will therefore no longer draw with pencil alone, but will create with the collaboration of technicians, scientists, professors and doctors and, in the fairly near future, with an electronic brain" [3]. The role of those in charge of representing the object, a system of objects or a phenomenon in general, turns out to be active, stretched in a continuous state of translation (graphic) of theories, norms, needs, facts, information and desires. It is therefore the images, in their flow of material and immaterial data, referring to objects but also to the space of living, be it real or virtual, that generate new knowledge and new desires.

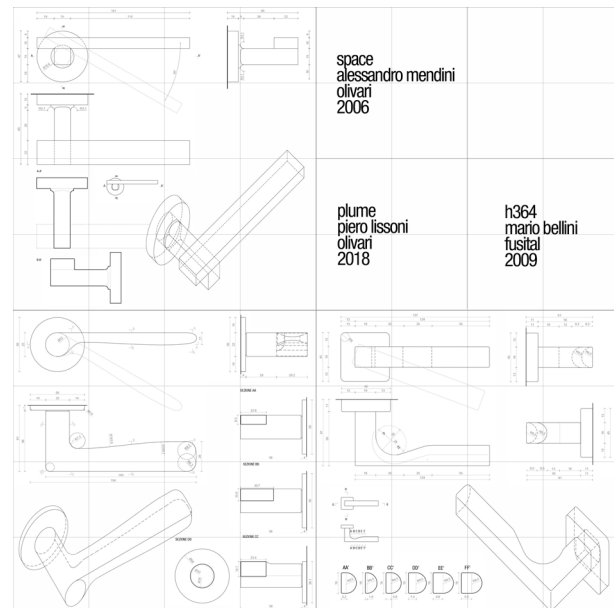
It is the *imago artificialis* [4] that unveils the object, that makes its figurative form visible through a constructed image consisting of "one or more drawings, possibly supplemented by numerical, textual, photographic and material annotations and aimed at the knowledge – analysis – or prefiguration – design – of certain objects, themes, contexts" [Cocchiarella 2009, p. 197].

The analysis of the existing iconographic material allows us to visualise the handle as a product of material culture, endowed with its own design autonomy. Studying the handle not only in its materiality and functionality, as a tool or a simple machine, but as a cultural object [Pinotti, Somaini 2016, p. 38], allows a broader view on the topic addressed in order to reconstruct the whole fabric of intentions and desires that surrounds each produced image, the concrete situation in which it arose, the meanings and values, the identities and stereotypes that have been recognised in it by those who produced it and those who use it on a daily basis. The iconographic material concerning these particular objects, images that allow them to be visualised in the cultural and environmental context to which they belong, use different media and devices, sensitive to the tools and techniques of drawing production, in the gradual transition from analogue to digital. They are

patent drawings, construction drawings, project drawings, dimensioned drawings. Rendering or study models in a digital environment, immersive drawings [Bistagnino 2018, p. 102]. Eidotypes and survey drawings, orthophotoplans [5] and high visual content images. Although they do not fall into the category of 'structured drawings', there are also photographs of the environment and details of the handle, photographs of prototypes and physical models produced during the conception and realisation process [6].

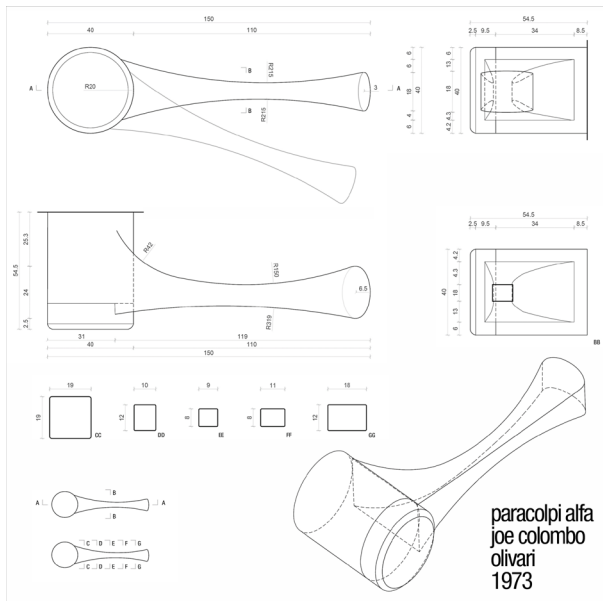
It is important to emphasise that in the design process, it may occur that some drawings are either placed side by side with, or completely replace, the prototype through experiences on plastic models. For example, the 'construction drawings', to which Anceschi recognises a fundamentally operative function [7], take on the role of controlling the proportions and relationships between the constituent elements. In illustrating the design methodology related to the realisation of the Gavina armchair, Achille and Pier Giacomo Castiglioni state that "a prototype was directly arrived at without drawing up any construction

Fig. 11. Survey and graphical representation of Author handles (some examples) Contemporary content (graphic elaboration by the authors).



drawings [...]. For it is impossible to invent these forms by drawing countless projections on the three orthogonal planes and at the same time verify the resulting volume in relation to function as well as its infinite perspective views” [Scodeller 2018, p. 168]. In the transition from the analogue space of representation to the digital environment and through applications dedicated to the virtual construction of the artefact, this difficulty is overcome, with processes of automatic, real-time visualisation with large degrees of freedom of the existing or prefigured object. Present in a fragmentary and never exhaustive manner in manufacturers catalogues, or in the archives of individual designers or, again, reproduced in specialist magazines and publications, the images of handles are presented in the form of structured drawings, the device of which, understood here as a “machine for seeing” [Deleuze 1980, p. 23] (and speak, reflect), identifies parallel projections as the method that best responds to the representative requirements of the object of study (figs. 8, 9).

Fig. 12. Survey and graphical representation of Author handles (some examples) Minimum analysis unit (graphic elaboration by the authors).



In parallel projections, projective methods codified by Descriptive Geometry, orthogonal and axonometric projections, the observer, in the dual role of narrator and spectator, assumes a particular position with respect to the object of representation. In projective terms, he is placed at an infinite distance that allows access to a “vision of the world from an angelically pure or transcendental position, characterised by an a-prospective and supposedly objective perception of sensible reality” [Docci 2003, p. 13].

Generally speaking, it can be stated that in “product design, articulated in many applicative realities dependent on different degrees of structural and functional complexity, there is a predilection for representative methods and models that, in addition to specifying the technical, functional and cultural specificities of this particular field of design, further reflect its conceptual and methodological originality, distinguishing it from other design fields and above all from architecture” [Bistagnino 2021, p. 42]. The graphic drawings in parallel projection show, in the technical-operational space of the design project, the peculiar character and fundamental requirement of the drawing of the artefact: exhaustiveness, precision, univocal interpretation. The final result of a profound process of comprehension, the drawing in orthogonal projection, in the frontal, top and side views, in the sections executed on a special element, or along the tracing that declares its geometric form, returns an ambivalent image of the object, suspended between the real and the virtual with a highly figurative symbolic code, capable of being read like a theorem or a mathematical formula [Pinotti, Somaini 2009, p. 58].

The language of orthogonal projection drawings is the one “that works among insiders. In the executive world of engineering design, for example, technical drawings have the prescriptive character of orders. And for those who give orders, it seems more important that they are unambiguous, rather than clear or even appealing” [Anceschi 1992, p. 70]. But it is axonometry, with its very ancient and privileged relationship with the industrial world [8], that occupies a pre-eminently technical role, functional to the primary objective of design precision (fig. 10). Like the machine, a paradigmatic object of the industrial world, consisting of mechanisms, hidden gears and automatisms.

The spatial representation, “all-round, makes it possible to simultaneously visualise the multiple formal, constructive and metric indications that, precisely through their co-presence in a single image, provide maximum clarity and exhaustiveness of information. The industrial object

is rationalised by the axonometric representation that conforms objective, exact plano-volumetric articulations marked by an absolute temporality, a sort of definitive 'immanence' of a fully developed and concluded idea". [Bistagnino 2021, p. 52].

The study of the iconographic material together with the visual and descriptive space that hosts it (Figs. 11, 12), introduces another aspect of the research work that defines the transition from drawing to the object in its plastic-formal reality: the graphic analysis of the artefacts. Oriented towards knowledge of the geometric peculiarities of the artefact, graphic analysis is, from a methodological point of view, a critical and operational tool that acts, through certain operations, on the object itself or its represented image.

The study of the handle relates, in this field and at this stage of research, to two fundamental analytical operations: discretizing and measuring [Rossi 2005, p. 30, 31]. In order to understand and measure an object, it is necessary to break down its physical compactness into a homogeneous system of parts, tracing it back to the collation of  $n$  components signalled by (abrupt or smooth) changes in form, transitional geometries that often correspond to changes in particular functions. Each component is then characterised by proportions that mutually connect widths, lengths and depths. The relationships between the parts establish a dynamic equilibrium capable of unfolding the reasons but also evoking the meanings of the design choices. The analysis data, through schematisations and simplifications, have the purpose of identifying the geometric matrices, the elementary volumes of the artefact and directing the drawing operations to form and structure the model built to life and in the cad environment [Rossi 2005, p. 41].

The operations underlying the formation of the model are those of solid modelling (extrusion, revolution, cutting, etc.), which describes the geometry of the object using entities such as surfaces, edges and vertices, or its topology through solid primitives among which a certain continuity can be recognised: the sphere, cylinder, prism, pyramid, cone, torus, among the smallest volumetric units that can be treated homogeneously from a mathematical and

computer science perspective [Rossi 2005, p. 44-46]. The genealogy of the handle recognises the cylindrical metal bar as the elementary primitive volume. In order to transform the simple form generated by the rotation of a rectangle around its side, into complex configurations, and achieve the results expected in the product design project, Gui Bonsiepe "indicates four elementary geometric operations –translation, rotation, specular reflection, dilation– which, according to the quantity and type of their reciprocal combinations, generate linear (on one axis), flat (on two axes), spatial (on three axes) compositional articulations" [Bistagnino 2018, p. 81]. Therefore, the handle sees its complexification through operations that in the CAD environment can be described as solid and classified on the basis of the prevailing and recognised geometric characteristics.

## Conclusions

From a methodological point of view, as we have seen, the study of the shape and the reading of geometric matrices is almost never an automatic operation or entrusted exclusively to the computer tool, which is delegated the task of solving the most complex issues, especially related to connection nodes, to the regions of contact, of interpenetration, of connection. It is an activity that develops through observation, the careful use of representation methods, especially moderate in a digital environment. It is precisely this processual integration which allows the analysis to be merged into an archive of drawings and models of which all the aspects that determine the design genesis of arthouse handles can be shown extensively: a map, a visual space which orders and frames the handles (re)presented through orthogonal and axonometric projections, with a representation methodology that follows the model of the table already used to define the compositional actions and develops following the narrative path in a fluid way, in order to favor and deepen the reading of the multiplicity and variety of shapes of these small design objects.

## Notes

[1] See: Scodeller 2019, p. 162.

[2] On the level of morphological content, one can assume as the operative field of product design that centred on the trinomial body-components-kinematics: Cocchiarella 2009, p. 151.

[3] See: <<http://www.gam-milano.com/it/mostre-ed-eventi/caro-joe-colombo/>> (accessed August 8 2022).

[4] The figurative form is thus the "designed object" and manifests itself through the imago artificialis, that is, the "constructed image" that

reveals to us the "figurative object", the object that "stays" in design: Cocchiarella 2009, p. 64.

[5] The application of photogrammetry to small-scale artefacts is currently being tested.

[6] Regarding the types of drawing functional to the representation of design, see Gui Bonsiepe's listing in Bistagnino 2018, p. 84.

[7] Distances and geometry are important as the receiver of such messages must be enabled to construct or reconstruct the represented object. The receiver can, that is, act on the message, e.g. take measurements: Anceschi 1992, p. 37.

[8] This refers to the method of axonometric representation, which has a very ancient history if considered as an image, i.e. as a way of intuitively depicting a given object, and a recent history if considered as a representation, or as a codified method.

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