July 25, 1973

To the Graduate Council:

I am submitting herewith a thesis written by Sonya Batchelor Kelley entitled "Design Solutions for Multifunctional Children's Furniture." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Related Art, Crafts and Interior Design.

Major Professor

We have read this thesis and recommend its acceptance:

Accepted for the Council:

Vice Chancellor for
Graduate Studies and Research

# DESIGN SOLUTIONS FOR MULTIFUNCTIONAL CHILDREN'S FURNITURE

A Thesis

Presented to

the Graduate Council of

The University of Tennessee

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by

Sonya Batchelor Kelley

August 1973

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Thanks is also extended to Kerry Kelley for his encouragement and assistance in helping complete this study.



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## ABSTRACT

It was the purpose of this study to propose six design solutions for plastic, multifunctional children's furniture that (1) were safe for use by a child; (2) were easy for the parents to maintain; (3) were durable; and (4) were versatile enough to serve a child's needs for eating, sleeping, and storage from birth to the age of twelve years.

The design for an eating facility was essentially based on the shape of a rectangle with a detachable seat. When turned with various sides facing upward and with the seat adjusted to the particular function, the unit became a high-chair, a feeding table, or a toybox with a separate side chair.

The other designs for sleeping and storage were a crib, youthbed, shelf, and two drawer units. All of these were designed to be hung from a plastic channel attached to the wall. Each of these pieces, including segments of the channel, could be purchased separately.

In order to maintain production feasibility, the designer consulted with two manufacturers of plastic furniture and assemlby parts.

The finalized designs were presented with the use of perspectives, working drawings, and small scale models

constructed of foam core board, balsa wood, and plastic to convey the idea in three dimensions.

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# CHAPTER I

## INTRODUCTION

> Children need an area of their own, where they can engage in active and creative play. With the restricted space available in apartments and small homes, it is very often the bedroom, yet this room is usually filled with furniture ill suited for the purpose. A minimum of furniture is needed, if it is designed to serve a variety of uses.[1]

This was a statement by Anna Campbell Bliss, guest editor of Design Quarterly magazine in 1963. One decade later, the same statement can describe the present storage area and open space for play because parents generally have the largest bedroom and the children have the smaller rooms.[2] To help provide more space in a child's room, multifunctional furniture[3] is needed.

Families are astonished at the cost of sleeping facilities from bassinet, crib, child's bed to adult bed offered on the market and they are reluctant to spend more money to get a better quality of craftmanship and design

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[1]Anna Campbell Bliss, "Children's Furniture," Design Quarterly, LVII (1963), 1.

[2]Statement by Dr. Ruth Highberger, professor in the Department of Child Development and Family Life at The University of Tennessee, personal interview, January 20, 1972.

[3]"Multifunctional" describes furniture that can be manipulated to form several pieces of furniture, each serving a different purpose.

when the furniture would be outgrown by the child in a short period.[4] Because today's families are having fewer children, furniture cannot be as efficiently used by the succession of children once common to families. For these reasons, children's furniture should be versatile enough to meet the changing needs of childhood.

In an effort to assess the present designs of children's furniture on the market, several manufacturers' catalogues of juvenile furniture were reviewed and several showrooms in High Point, North Carolina, and Atlanta, Georgia, were visited. It was found that little attention is given to the special needs of children when designing their furniture. The primary design consideration for children's furniture seemed to be only a reduction in the scale of adult forms.[5]

Because children's furniture has to suffer a great deal of abuse, considerations for the design of their furniture must include safety and durability. Some of the guidelines for the designing of children's furniture were: (1) that exposed hardward be minimized; (2) that all corners should be eliminated or softened by blunting them; (3) that construction should be as light as possible; (4) that each item

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[4]Bliss, p. 1.

[5]Based on personal correspondence between Mr. Clarence E. Greenway, Director of Advertising at Drexel Enterprises, and the writer, February 11, 1972.

should be easily mobile; (5) that colors should be bright and appealing; (6) that surfaces should be extremely hard and durable; and (7) that maintenance should be considered in the selection of materials, details of design, and mechanical features.[6]

The manufacturing of multifunctional furniture in the United States is almost nonexistent. The majority has been found in recent competitions or designed for personal use.

The multifunctional children's furniture designed for special competitions or personal use met the design guidelines for children's furniture; however, the furniture currently on the market that has been advertised as being multifunctional did not. Two of the designers that followed the guidelines for children's furniture attempted to get their products manufactured. The manufacturers thought the concept of multifunctionality was unique but felt that the public would not accept the new plastic designs that were so different from the wood and metal furniture on the market.

In correspondence from Mr. Phil Crossman, Director of Design for Krueger Furniture, he stated that very little time or effort goes into the design of the children's furniture manufactured by his firm. With rare exception,

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[6]"Low Cost But of Museum Quality," The Knoxville News-Sentinel (Knoxville, Tennessee, March 21, 1971), Section E.

he could think of few other companies that gave a great amount of attention to the design of this type of furniture.[7]

The problem in the United States is not a lack of talent, but rather the lack of an established market for well-designed products. This seems to be caused by the indifference of manufacturers and an uninformed public. Manufacturers seem to be content to offer a few sentimental details as a substitute for new solutions to the problem of poor design of children's furniture.[8]

## I. STATEMENT OF THE PROBLEM

The purpose of this study was to propose design solutions for multifunctional children's furniture. In designing the furniture, the primary considerations were: (1) the special requirements for children's furniture; (2) physical characteristics of children; and (3) versatility.

## II. IMPORTANCE OF THE STUDY

Because the majority of multifunctional children's furniture is manufactured outside of the United States, it is hoped that the suggestions for designs of this type of furniture will: (1) inform the public about the safety and

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[7]Based on personal correspondence between Mr. Phil Crossman, Director of Design for Krueger Furniture, and the writer, April 10, 1972.

[8]Bliss, p. 2.

maintenance advantages of multifunctional furniture; (2) help to create a demand for better designs in children's furniture; and (3) provide parents with information on features to consider when buying children's furniture that will serve their changing needs.

## III. DEFINITION OF TERMS

Definition of terms as used in this study are:

Multifunctional is defined as furniture that can be manipulated to form several pieces of furniture, each serving a different purpose. This purpose does not contain as aspect of entertainment.

A child is defined as a young person of either sex from the age at birth to twelve years.

A changing table is a flat surface conveniently located near the child's sleeping area which is used for changing an infant's diapers and/or clothes.

A crib is defined as a small bed with all four sides enclosed to protect the baby from rolling off the mattress.

A youth bed is a sleeping surface for a child who would be inconvenienced by the heights and lengths of twin or regular size beds. The standard size for a youthbed is 66" in length and 33" in width.

A highchair is an elevated chair with a tray for holding food.

A feeding table is a low table with an attached chair. It is used for self-feeding or as a play surface.

## IV. LIMITATIONS

This study was limited to design solutions for multifunctional children's furniture. These designs were proposed after reviewing physical characteristics of children and the special requirements of their furniture.

This furniture is to be utilized for basic physical needs--eating, sleeping, and storage--for a child. It is not designed to be used as an instrument in play activities.

The feasibility of the design solutions and suggestions for materials of construction were limited to the opinions of the thesis committee, furniture manufactures, and child development consultants.

Because of the constantly changing furniture market, conclusions were limited to the time and scope of this study.

## V. PROCEDURE

Names and addresses of manufactures and designers of children's furniture were obtained from periodicals, books, and trade directories. Letters were sent to these manufacturers to determine what amount of multifunctional furniture was being manufactured in the United States and what criteria

they felt were important in designing children's furniture. A list of the manufacturers and designers is included in Appendix A.

Additional letters were written to the designers and manufacturers of multifunctional children's furniture to determine the public's reaction to their products, to obtain suggestions for making the public more aware of the advantages of multifunctional furniture, and to get an indication of the mass production techniques they have found beneficial.

Interviews were conducted with members of the faculty in the Department of Child Development and Family Life at The University of Tennessee, Knoxville, concerning the needs and characteristics of children in terms of their furniture.

Children were observed in the day care center of the Department of Child Development and Family Life in the College of Home Economics at The University of Tennessee in Knoxville, and in the Little Red Schoolhouse kindergarten on Vanosdale Road in the West Knoxville area of Knoxville, Tennessee.

The thesis committee gave helpful criticisms of the proposed designs and suggestions of ideas to improve them. The preliminary designs were reviewed by Mr. Ken Smith, manager of Decorative Components Division of Polysar Plastics, and Mr. George Dunbar, product design engineer for Kusan,

Incorporated, to assess their potential for efficient and economical production.

In presenting the solutions for multifunctional furniture, perspectives and working drawings were used. To determine the manipulatory ability of the designs, models were constructed using a scale of three inches equals one foot. These models were built of foam core board, plastic, and balsa wood and were presented to the thesis committee, child development consultants, and the furniture manufacturers for final evaluation of their feasibility in relation to the needs of children and their ability to be mass produced.

Conclusions were drawn concerning the accomplishments of the researcher in preparing the design solutions for the multifunctional children's furniture and suggestions were given for the improvement of future children's furniture produced in the United States.

# CHAPTER II

## REVIEW OF RELATED LITERATURE

In order to determine the amount of multifunctional children's furniture being designed or manufactured in the United States, letters were sent to manufacturers, design magazines were reviewed, and showrooms in High Point, North Carolina, and Atlanta, Georgia, were visited. After examining 46 manufacturers' catalogues and several hundred magazine articles, only ten designs of multifunctional children's furniture were found.

Besides the brief explanations given with each design, references on the subject were very limited. Most of the detailed information was obtained through correspondence with each designer or manufacturer.

### I. REVIEW OF MULTIFUNCTIONAL CHILDREN'S FURNITURE IN THE UNITED STATES

Four of these designs were results of the Unique Furniture Design Competition sponsored by the United States Department of Housing and Urban Development in January, 1971, another was custom designed by an architect for his child, and the others were offered by two mail order companies and five children's furniture manufacturing companies.

The Unique Furniture Design Competition was concerned with solutions for upgrading the environment of low income families. The competition brochure emphasized human needs and a total systems approach. The designers were requested to concentrate on solutions based on criteria that included appearance, comfort, durability, and economical production. The entrants were asked to address themselves to the seating, serving, sleeping, storage, and multifunctional needs of children and adults.

The technical considerations which concerned the jury were: (1) good proportions for the human figure and for the space in which the design would be used; (2) good construction; (3) good use of materials; and (4) mass production potential. The last three would also contribute to reasonable pricing.[1]

Two of the winners designed systems for the child's bedroom that were to be used from infancy to the teenage years.

Mr. Walter T. Brucker, an interior designer from San Marina, California, had the feeling that children's furniture had only been dressed up or slightly modified for the last 20 years. He felt the need for a whole new concept

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[1]U.S. Department of Housing and Urban Development, Focus on Furniture: An Important Element in Housing, No. Rt-2 (Washington: Government Printing Office, 1971), pp. 9-11.

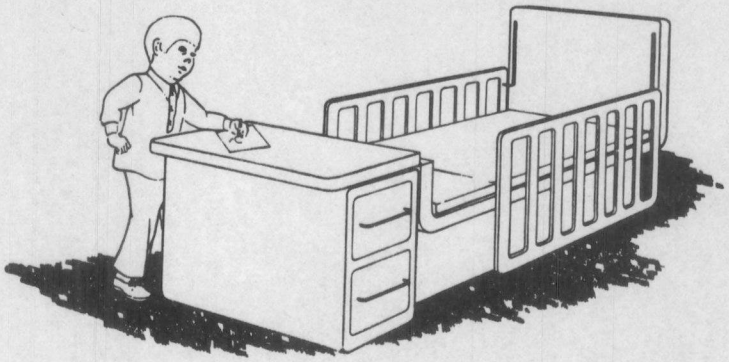
of children's furniture; as a result, he designed "Cribed" (Figure 1).

He began his research by watching the movements and analyzing the needs of his two year old son. After completing a schematic design, Mr. Brucker reviewed the design with many parents, asking for both negative and positive responses. Although some of these people were in middle to high income brackets, most of his attention was focused on the poor or very low income families. All of these people had the same problems even though they were stated differently. Some of the problems mentioned were the lack of space, cost of many pieces of furniture, and the need for easy maintenance and durability. All of these problems were redesigned into the final "Cribed."[2]

This multipurpose design could supply all of a child's sleeping needs from birth to at least ten years of age. One unit was used to replace many separate items such as a bassinet, crib, youthbed, changing table, chest of drawers, and play table. A two drawer unit rested on the bed base and the drawers pulled from either side. A mattress placed on top of the drawer unit served as a changing table. One

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[2]Based on personal correspondence between Mr. Walter T. Brucker, Director of Interior Design, Charles Luckman Associates, and the writer, March 17, 1972.



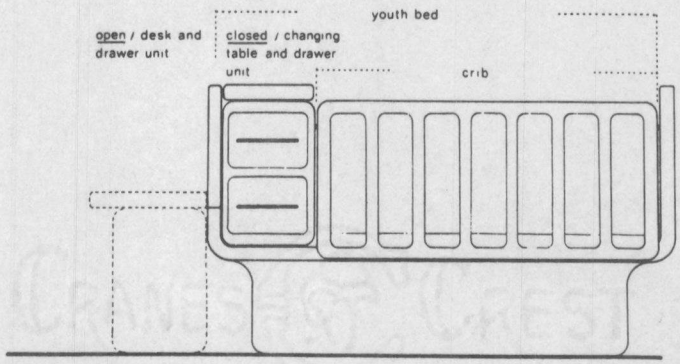



Figure 1. Cribed designed by Mr. Walter T. Brucker.

Source: U.S. Department of Housing and Urban Development, Focus on Furniture: An Important Element in Housing, No. Rt-2 (Washington: Government Printing Office, 1971), p. 15.

of the plastic drawers, if removed, served as a bassinet for the newborn.[3]

The material specified was rigid polyurethane foam. The advantages of it were: (1) its self-skinning quality; (2) light weight for shipping; (3) ease of manufacture; (4) durability; and (5) ease of cleaning by using alcohol and water. The estimated retail cost was $175.00 with color options available.[4]

A full size model was made by Mr. Brucker, photographed, and tested by six manufacturers. Each of these was very interested in the design but felt that the deviation from the normal trends in children's furniture was too extreme.[5]

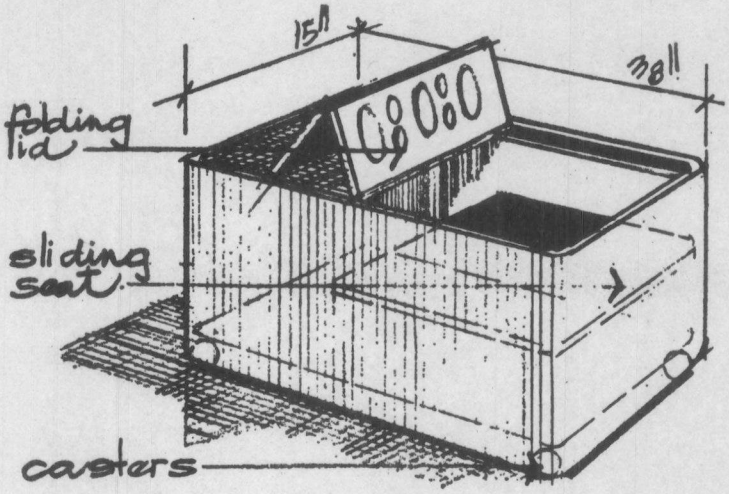
Three multifunctional designs were submitted to the competition by Mr. John Ellyard from Knoxville, Tennessee. His juvenile multifunctional furniture consisted of a bed, chair, and play box (Figure 2).

The furniture was designed to withstand wear and tear and to meet the other special requirements of children's furniture. All of the corners were rounded to protect the child from injury in the event that he hit himself during a fall. The hardward was minimized with the only exposed

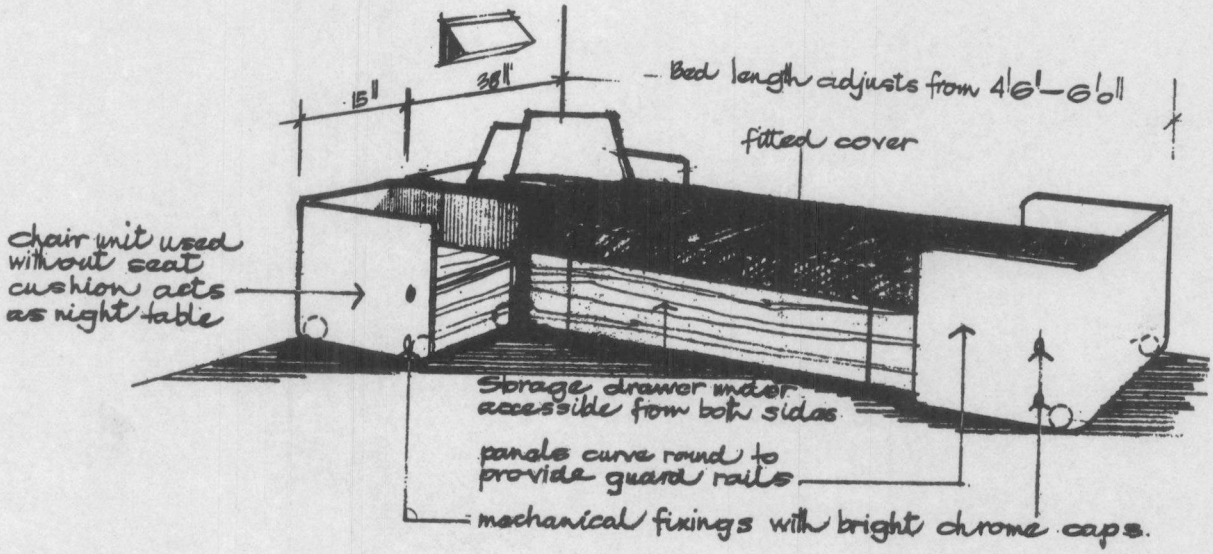
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[3]U.S. Department of Housing and Urban Development, p. 15.

[4]Brucker, July 28, 1972. [5]Ibid.




(a) Toy box




(b) Bed and nightstand

Figure 2. Bed, nightstand, and toy box designed by Mr. John Ellyard.

Source: U.S. Department of Housing and Urban Development, Focus on Furniture: An Important Element in Housing, No. Rt-2 (Washington: Government Printing Office, 1971), p. 19.

hardware being bright, chrome caps to cover the screws. Recessed casters were added to make it easily mobile.

Mr. Ellyard had previously specified white oak as the material of construction, but for the purpose of a cost reduction, felt that rigid polyurethane foam with texture and color integrated was best.

The features of his bed were that it grew with the child, extending from 4'6" to 6'0" in length, and had storage drawers underneath which were accessible from either side. The bed would retail for approximately $70.00.

To make a nightstand, only the pillow had to be removed from the seat of the chair. The approximate price of it was $10.00.

The play-toy box could be used as a table and seat or the seat could slide so that the child could get to the toys stored in the bottom of the box. This piece retailed for about $22.00.[6]

Mr. Conrad Levenson, an architect from New York, New York, designed a furniture system for his wife's expected child. The basic premises on which he designed this system were: (1) safety for a young child; (2) ease of maintenance; (3) resistance to damage and durability of construction;

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[6]U.S. Department of Housing and Urban Development, p. 19.

(4) flexibility of use in terms of adaptability to the changing needs of a young person.

With the above criteria in mind, he and his wife visited friends with small children and observed the parent's movements while dressing, changing diapers, and feeding their children. They also measured children's furniture currently on the market.

Mr. Levenson's solution was "Metamorphosis," a system of modular furniture components designed to serve the needs of young people from infancy to adulthood (Figure 3). The individual components could be converted from one use to another and the arrangement of the components could be adjusted to meet the changing needs of a growing child. The components were designed to be assembled into compact configurations when the child is very small, in order to conserve space. As the child grows and his need for space and a variety of types of furniture and storage increases, the components could be changed into separate pieces of furniture.

Metamorphosis was a compact combination with a crib, changing table, and storage drawers. When the child outgrew the crib, it was removed and relocated as a dresser (Figure 4) and the remaining storage drawers provided the platform for the child's new bed (Figure 5). Additional storage drawers could be stacked to provide more storage space. The storage

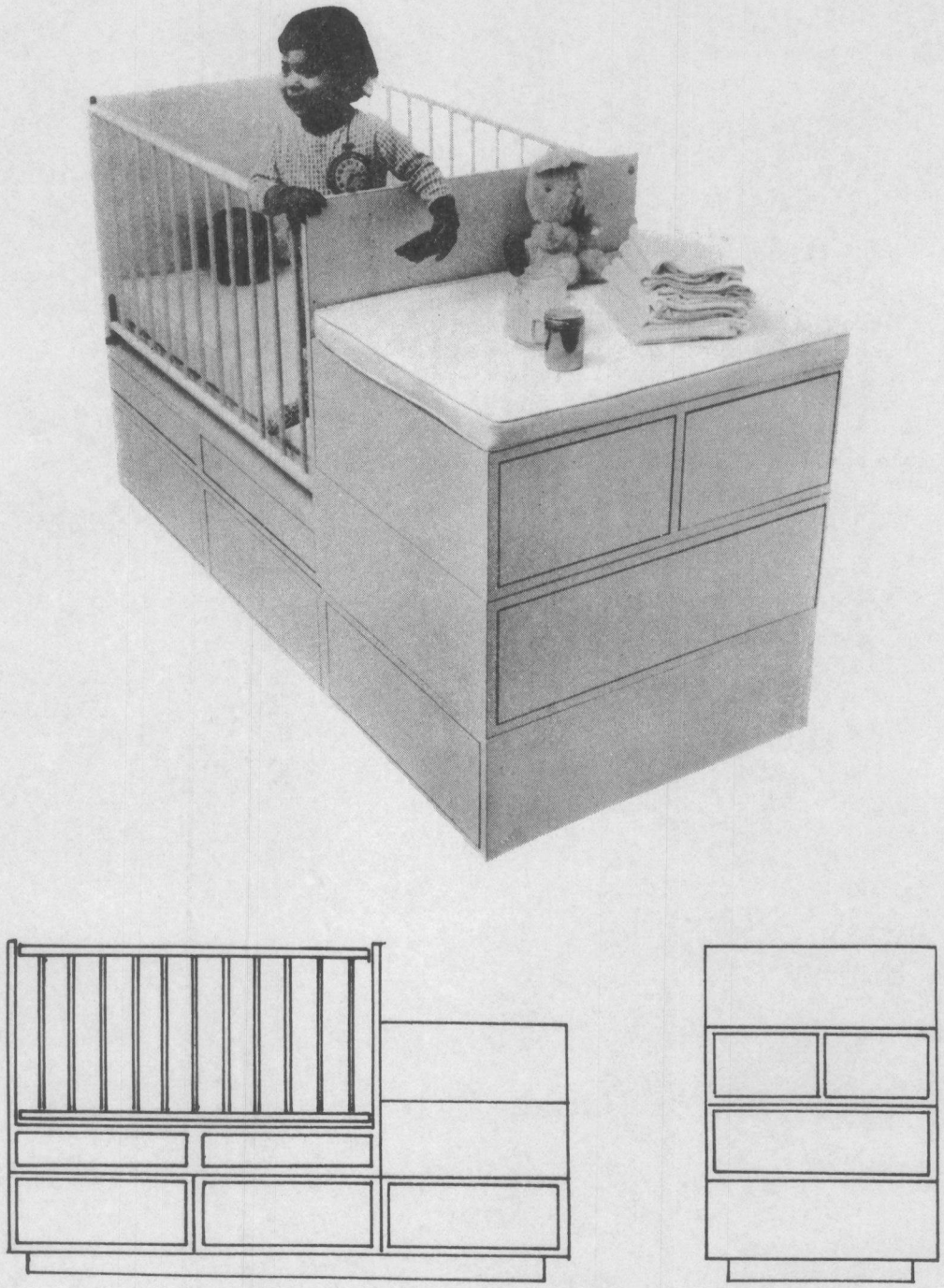
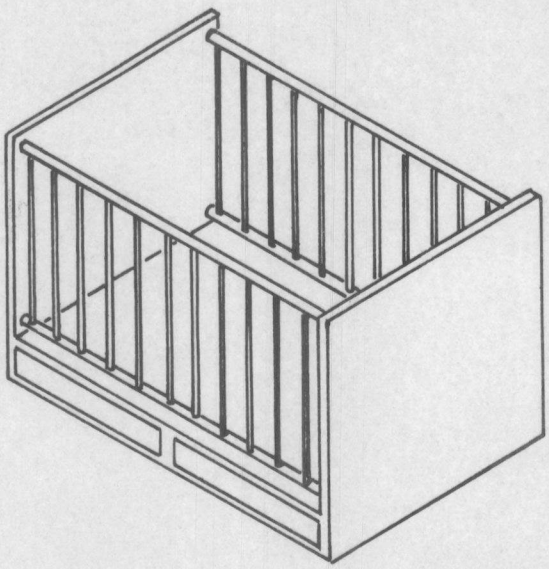


Figure 3. Metamorphosis designed by Mr. Conrad Levenson.

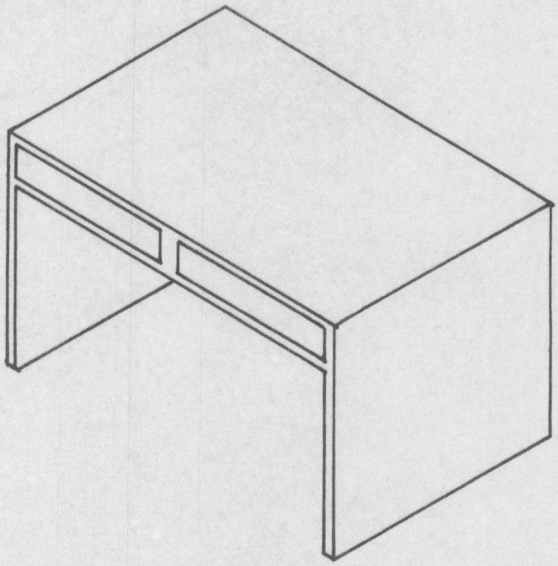
Source: Susan Lewin, "Design," House Beautiful, CXIV (July, 1972), 6; Conrad Levenson, "Metamorphosis" (New York: Advertisement, 1972), p. 11. (Mimeographed.)



(a) Dresser used as a desk



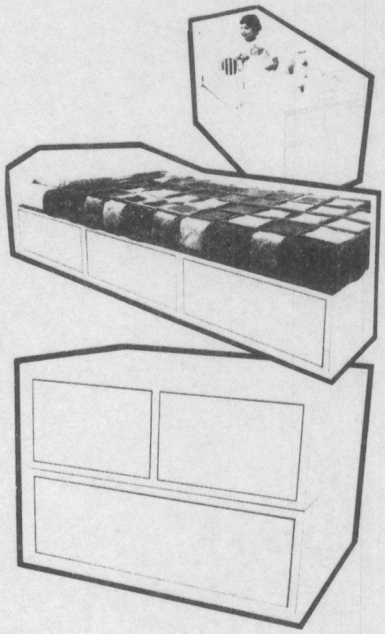
(b) Crib



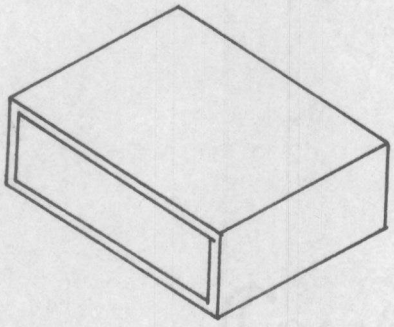
(c) Dresser

Figure 4. Crib-dresser designed by Mr. Conrad Levenson.

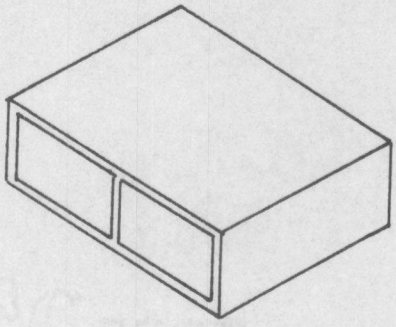
Source: Susan Lewin, "Design," House Beautiful, CXIV (July, 1972), 10; Conrad Levenson, "Metamorphosis" (New York: Advertisement, 1972), p. a. (Mimeographed.)



(a) Platform bed and stacked storage drawers



(b) One drawer unit



(c) Two drawer unit

Figure 5. Platform bed and storage drawers designed by Mr. Conrad Levenson.

Source: Susan Lewin, "Design," House Beautiful, CXIV (July, 1972), 10; Conrad Levenson, "Metamorphosis" (New York: Advertisement, 1972), pp. d and e. (Mimeographed.)

drawers were large enough to accommodate bedding, clothing, toys, books, and other bulky items.

The components, when stacked one upon the other, were separated by a thin sheet of compressible polyurethane. These combinations of components were then supported on a fixed base or on a steel frame with casters to permit easy movement for cleaning.

The system did not have exposed hardward because all doors and drawers were equipped with touch latches which did not permit easy opening until a child is old enough to operate them safely. The drawers, which opened with a strong touch, were one of the best features of the system but were expensive to make.

All exposed surfaces were finished with plastic laminate to facilitate cleaning, to resist damage, and to provide a safe nontoxic surface for children.

The crib rails were made of strong, welded, tubular steel and covered with an easy to clean, nontoxic vinyl coating. The moveable crib rail lifted out and slid under the mattress shelf for easy cleaning of the crib and changing of the linens. The height of the mattress shelf was adjustable so that it could be high for the convenience of the adult when the child is an infant and lowered for safety as the child grows older and taller.

Because of the cost of producing the system, Mr. Levenson was considering injection molded plastics to reduce the cost so a larger market could benefit from this space-saving system.[7]

In the 1973 spring and summer catalogue of a mail order firm, two versions of a "three-way" chest, another type of multifunctional furniture were shown. In both, the top converted from a changing table to a desk with drawers below.[8] This versatility was a start in the direction toward multifunctionality, but the desk height was 36". The recommended height for a child four years old is 17-1/2" and for a child twelve, the proper height is 24".[9]

Wooden cribs were offered by two mail order firms and four children's furniture and accessory manufacturers.[10]

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[7]Based on personal correspondence between Mr. Levenson, architect, and the writer, April 13, 1973.

[8]Catalogue, Sears, Roebuck and Company, 925 South Homan Avenue, Chicago, Illinois, 1973 Spring and Summer, p. 900.

[9]Dreyfuss, Henry, The Measure of Man (2nd ed.; New York: Whitney Library of Design, 1967), chart E.

[10]Sears, Roebuck and Company, p. 897; Ibid; Sears, Roebuck and Company, p. 901; Catalogue, J.C. Penney Company, 11800 West Burleigh Street, Milwaukee, Wisconsin, 1973 Spring and Summer, p. 356; Advertisement, Small World, no. 7, XXII (July, 1972), 10; Advertisement, Small World, no. 10, XXIII (October, 1972), 105; Small World (October, 1972), p. 9; and Catalogue, Thayer, Incorporated, Gardner, Massachusetts, 1973.

This type of crib converted to a playpen, changing table, or travel bed. These designs were not very different from the designs of several decades ago.

Another type of crib opened into a playpen. Being a more recent design, this type was made of steel with the top and bottom rails covered in polyurethane foam and nylon mesh sides.[11]

Although the designs by Mr. Brucker, Mr. Ellyard, and Mr. Levenson are not being commercially mass produced, they do meet the criteria for multifunctional furniture as previously stated. The products which are currently on the market are multifunctional in some respects but they have many safety hazards such as sharp corners and exposed hardware; thus they cannot be considered ideal multifunctional furniture. These products are being promoted as multifunctional by their respective companies.

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[11] Small World (October, 1972), p. 19.

# CHAPTER III

## PRESENTATION

After correspondence with specialists in both child development and furniture design, the characteristics which they felt should be the primary considerations in designing multifunctional children's furniture were summarized as: (1) safety; (2) durability; (3) versatility; (4) ease of maintenance; (5) reasonable price in relation to durability and design; and (6) designed for the physical characteristics of the child.

The author scrutinized all of the multifunctional furniture found, retained the good ideas, and attempted to overcome some of the extremely poor design features. Concentrating on the primary considerations recommended by the specialists and the ideas gathered by examining existing multifunctional furniture, the writer proposed six designs for sleeping, storage, and eating to serve the needs of a child from birth to twelve years of age.

The proposed six solutions were designed to be manufactured in plastic. The material was a very feasible choice because it offered added design potential. By using plastic, the furniture had additional advantages which included: (1) light weight and strength; (2) durability;

(3) one piece construction without seams or joints; (4) colorability;[1] (5) consistent appearance; (6) corrosion resistance; and (7) ease of maintenance.[2]

To get a better idea of the manipulatory action of the design, models were made of foam core board, plastic, and balsa wood. The joints were glued together and smoothed with sandpaper to further simulate the actual designs in plastic. The models were made to a scale of three inches equals one foot.

## I. HIGHCHAIR--FEEDING TABLE--TOYBOX

This unit consisted of two basic pieces, a rectangular box and a detachable seat, which could be manipulated to form various types of furniture (Figures 6, 7, and 8).

As illustrated in Figure 6, the unit became a highchair that was 28" high. This height would be convenient for an adult sitting in a side chair of normal seat height (16" to 18") to easily feed the baby.[3]

The tray in the highchair could be completely removed for a more convenient placement and removal of the baby from

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[1]"Plastics in the Furniture Industry," Interiors, no. 6, CXXXII (January, 1973), 119.

[2]"Target Tomorrow. Plastic As Plastic," Interior Design, XL (January, 1969), 114.

[3]Henry Dreyfuss, The Measure of Man (2nd ed.; New York: Whitney Library of Design, 1967), chart H2.

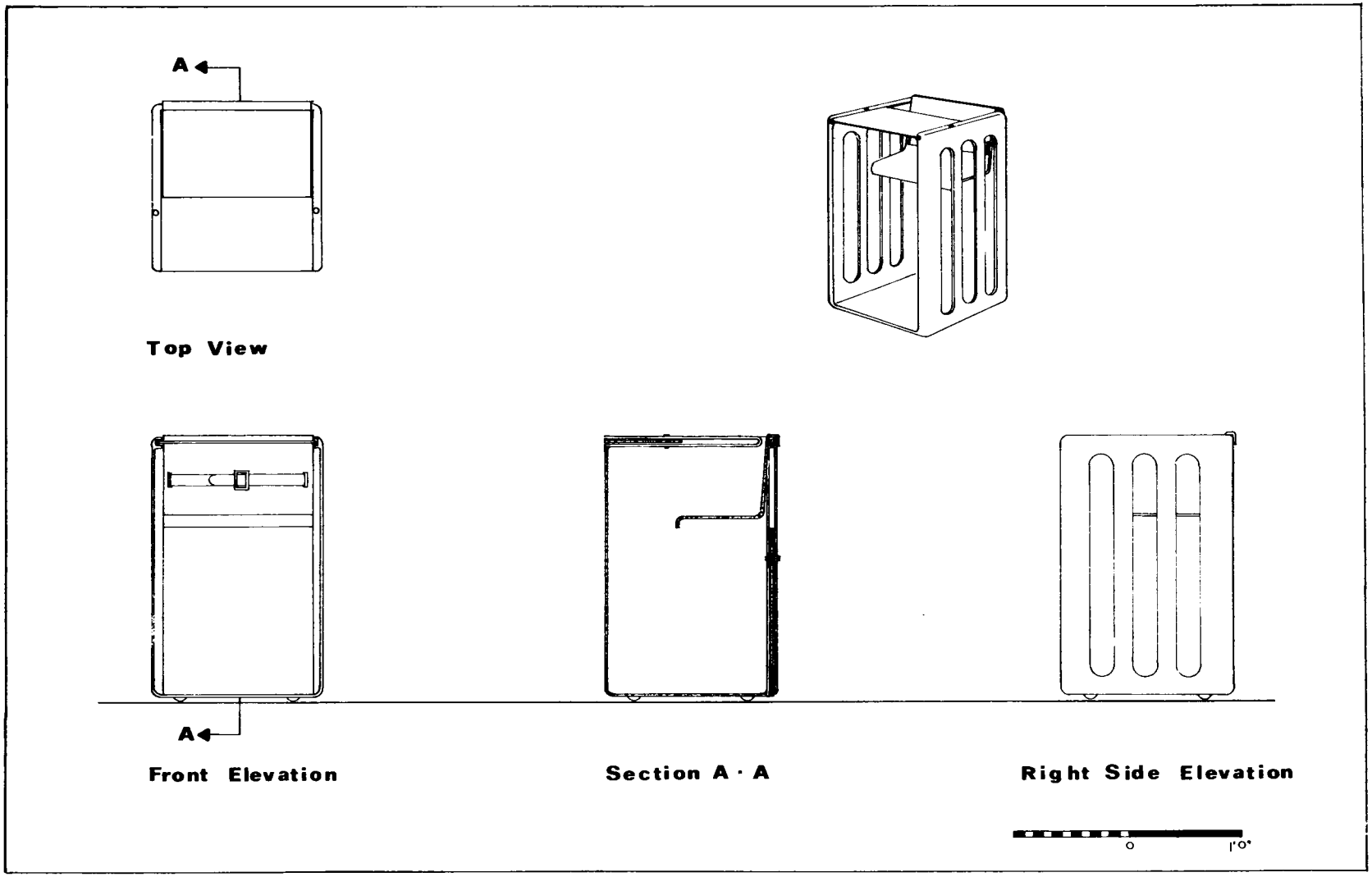



Figure 6. Highchair.

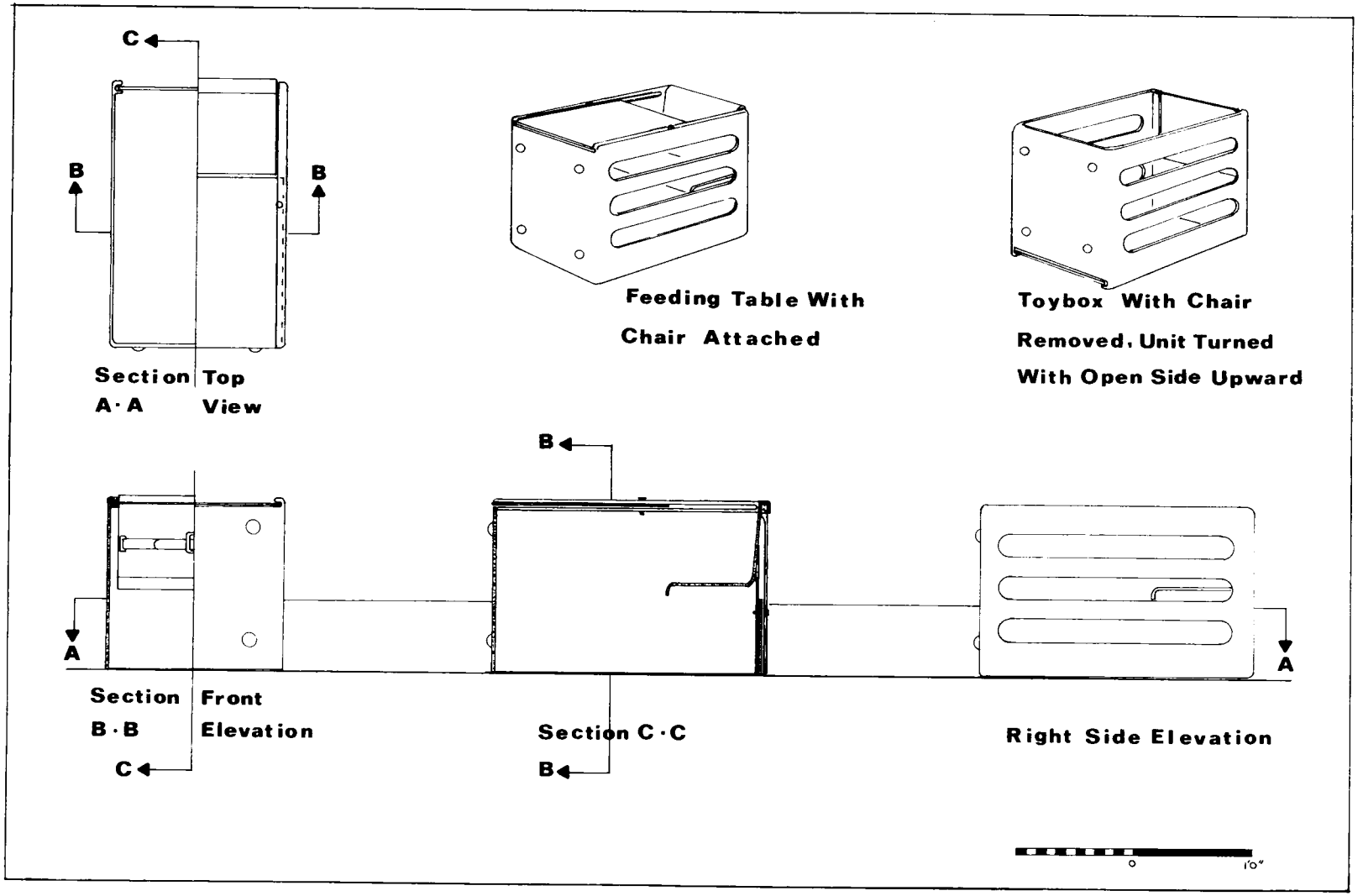



Figure 7. Feeding table and toybox.

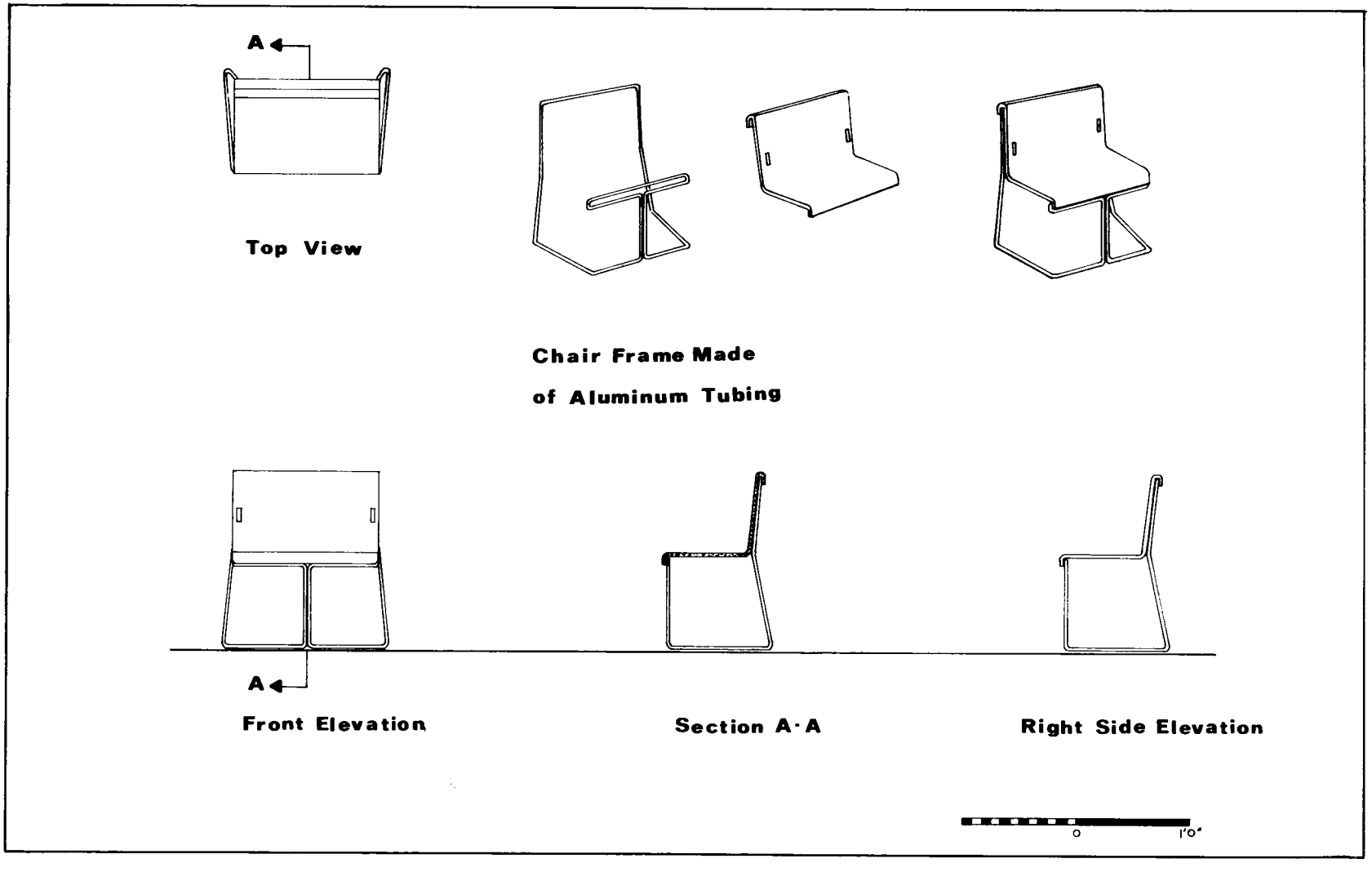



Figure 8. Chair and base.

the seat. The tray was held in either of its three adjustable positions by plastic pegs. It was 8" deep and 18" wide, which was ample space for a child's plate, flatware, and beverage container.

When the unit was turned as in Figure 7, it became a feeding table. The tray was attached in the same manner as in the highchair and it could also be completely removed.

The chair in the feeding table was designed to have a seat height of 9" which was recommended by Henry Dreyfuss in his anthropometric chart for children two to three years of age.[4] The advantage of the feeding table would be its shorter distance to the floor for the child who was beginning to feed himself.

The chair could be completely removed and the unit used as a toybox. Because it was specified to be made of plastic, a child could move it easily.

Because of his extensive knowledge of plastics, Mr. Ken Smith, manager of Decorative Components Division of Polysar Plastics, Incorporated in Forest City, North Carolina, assisted with the selection of plastic and method of fabrication for the highchair-feeding table-toybox unit.

A list of specifications and the design ideas were given to Mr. Smith. After studying them, he suggested that

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[4]Dreyfuss, chart E.

either polyethylene or polypropylene be injection molded to form the unit.[5] The advantages of polyethylene are: (1) low cost; (2) chemical resistance; (3) toughness; (4) scratch resistant surface; and (5) tensile strength. The advantages of polypropylene were: (1) impact strength; (2) scratch resistant surface; (3) chemical resistance; (4) heat resistance up to 240°F.; (5) resistance to stress cracking; and (6) resistance to moisture.[6]

Injection molding is a widely used process for high speed, low cost molding of items required in high volume.[7] With this process, measured amounts of plastic pellets or powder are fed from a hopper into a heated cylinder. Each measured charge is forced forward by a plunger into the shaped cavity of the closed mold, where the plastic is cooled and solidified. The mold is opened and the plastic shape is ejected.[8] This entire process requires only one minute.[9]

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[5]Statement by Mr. Ken Smith, manager of Decorative Components Division of Polysar Plastics, Incorporated, Forest City, North Carolina, personal interview, June 9, 1973.

[6]Charles E. Chastain, "A Plastics Primer," Modern Plastics Encyclopedia, XLVI (1969-1970), 26.

[7]J. Harry Dubois, Plastics (New York: Reinhold Publishing Corporation, 1967), p. 81.

[8]Chastain, p. 27.

[9]Statement by Mr. George Dunbar, product design engineer, Kusan, Incorporated, Nashville, Tennessee, personal interview, June 16, 1973.

The slots on the side of the unit were to be formed by core molding. The plastic would be formed around a core which is pulled away after the shape is ejected from the mold, thus leaving the voids in the sides of the unit.[10]

To reduce the cost of production, sheets of plastic were suggested for the sliding trays in the highchair and feeding table.[11]

The use of plastic in the construction would facilitate easy cleaning of the unit. There would be no corners to attract dirt. The entire unit could be put in a bathtub or hosed in the yard for cleaning with a mild detergent and water.

The suggested retail price of the highchair-feeding table-toybox was $40.00 and $5.00 for the metal base.[12]

## II. WALL MOUNTED FURNITURE SYSTEM

The five designs for sleeping and storage were a crib, youthbed, one drawer unit, two drawer unit, and a shelf. For the economical production of these, the number of pieces per unit and the hardware used to assemble them were reduced by using a wall mounted system rather than a free standing one.

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[10]Smith, June 9, 1973. [11]Ibid.

[12]Smith, July 13, 1973; the estimated price and those quoted hereafter are based on a production run of 100,000 to 200,000 pieces.

Mr. George Dunbar, product design engineer for Kusan, Incorporated, in Nashville, Tennessee, was consulted to assist with the selection of plastic and a method of fabrication. After analyzing the specifications for the proposed designs for the wall mounted furniture, he suggested a structural foam made of polystyrene for the wall mounted furniture system.[13] The advantages of polystyrene are: (1) low cost; (2) rigidity; (3) chemical resistance; (4) lightweight; (5) moisture resistance; and (6) impact strength.[14]

In the production of structural foam, a chemical blowing agent is mixed with plastic pellets or powder so that when the mixture is heated, a gas is given off. It expands the soft molten plastic into a foamed structure which takes the shape of the mold.[15] All of the pieces of the furniture system were to be made from structural foams and by the process described above with the exception being the wall channel. The extrusion method was specified for the wall channel. In this procedure, polystyrene is fed to a melting plate and as the plate enters the extruder, an expansion agent is added. When the molten plastic is extruded into a

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[13]Dunbar, June 16, 1973.

[14]Chastain, p. 26.

[15]Chastain, p. 29.

mold, immediate expansion takes place and is completed in a fraction of a second at relatively low pressure.[16]

The various pieces in this system were to be attached by a modified dovetail method, an extension from the furniture that was designed to be hung from a channel attached to the wall (Figure 9). A 1/2" standoff from the bottom of each piece would balance the furniture. Because of the strength of polystyrene, the interlocked dovetail was to be only 1/2" from the wall.

The channels came in 18" and 36" lengths and could be purchased as needed with additional pieces of furniture. The estimated cost of the 18" lengths was $1.00 and the 36" lengths was $2.00.[17] To enable the consumer to place the screws holding the channel into studs in the wall, no holes were specified to be predrilled. The consumer could drill the hole in the desired location with a small electric or hand drill.[18] Two screws provided with each section of channel would have their heads coated in polystyrene to match the color of the channel. The bottom of the channels were recommended to be placed 6", 13-1/2", and 44" above the floor.

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[16]Dubois, p. 69.

[17]Dunbar, July 12, 1973.

[18]Dunbar, June 16, 1973.

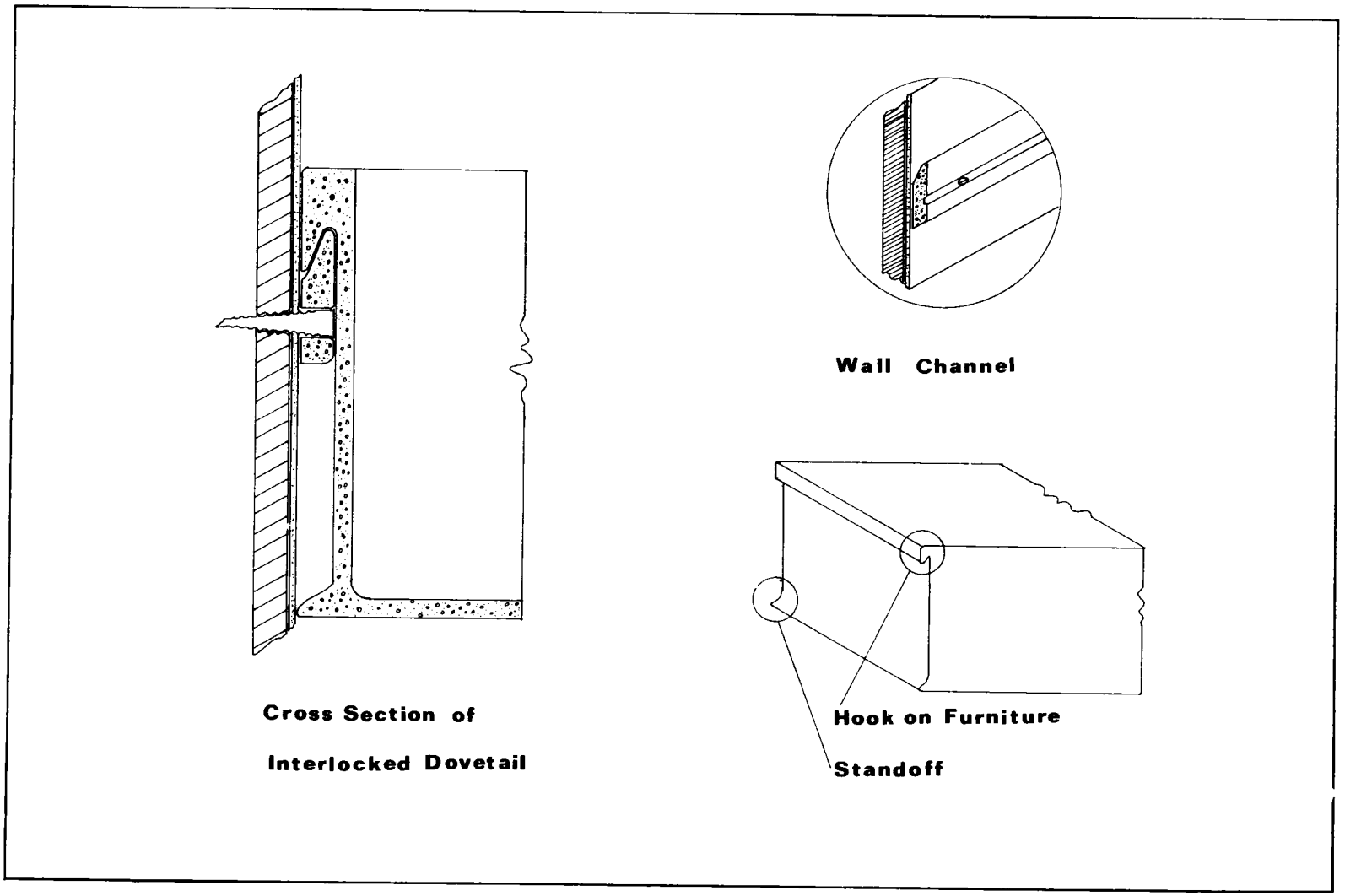



Figure 9. Detail of wall channel and modified dovetail.

Because of the strength in structural polystyrene foam, the wall thickness of each piece was specified to be only 3/8". Because of their light weight, the pieces could be easily rearranged and cleaned.

## III. CRIB

The crib (Figure 10) was to be made in one piece with the exception of the dropside of the front. This would be a convenience aspect for the mother to allow her easy access to the child (Figure 11) or to change the bed linens. Hooks, on each end of the dropside, attached to extensions from the ends of the crib were needed to keep the section intact while the child was in the crib. The section was 16" wide and was specified to be folded with a piano hinge attached by bolts molded into the crib and the dropside section.

The specified mattress was a 5" medium density polyurethane foam that used standard 27" by 52" crib sheets. The crib was designed to use standard linens so that there would be no extra costs for custom made sheets.

When the crib was removed from the wall, it could be used as a playpen. After the child had outgrown the crib, it could be placed with the dovetail and standoff resting on the floor and with the addition of a wood shelf, could be used as a bookshelf or for toy storage. The shelf could be

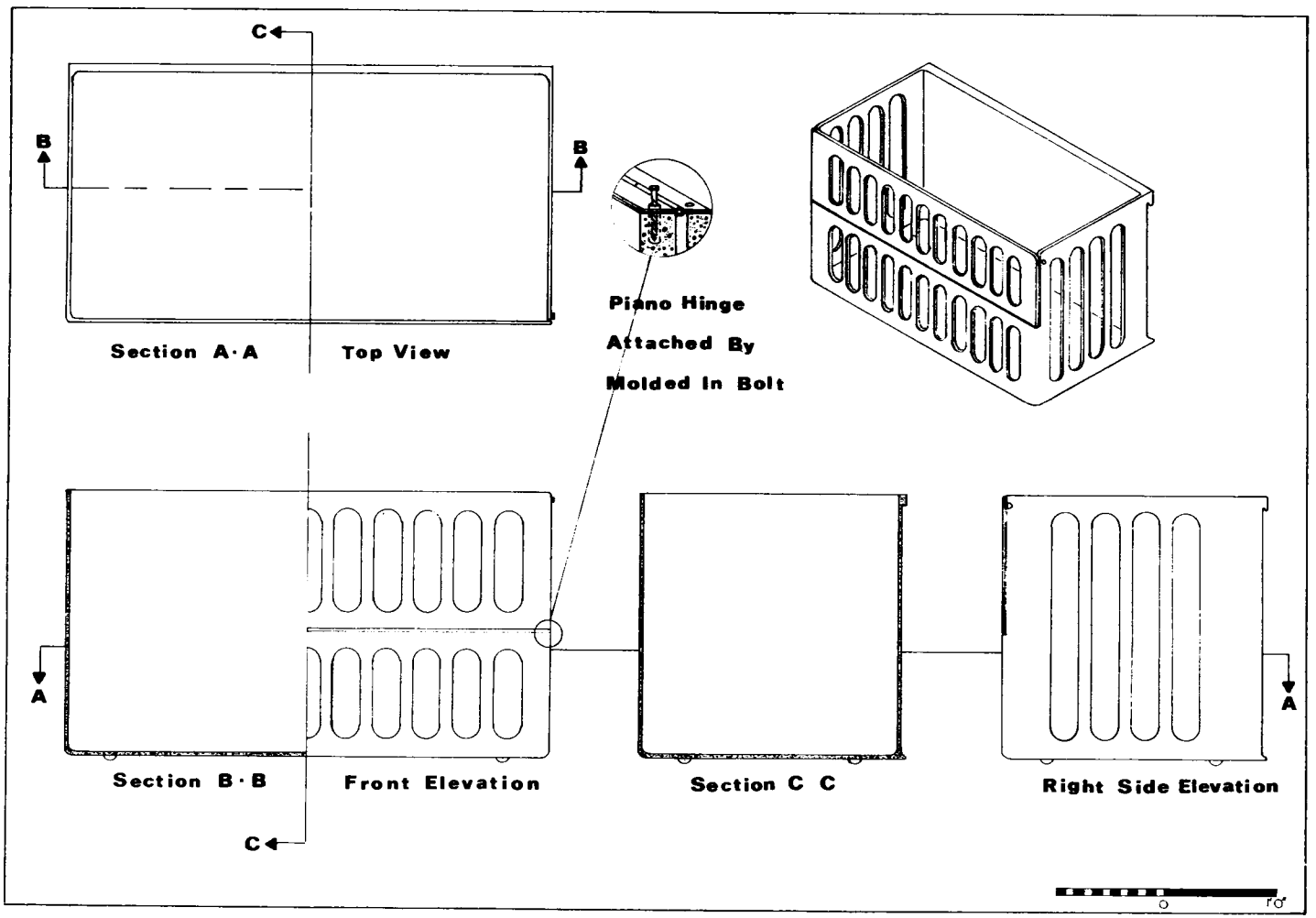



Figure 10. Crib.

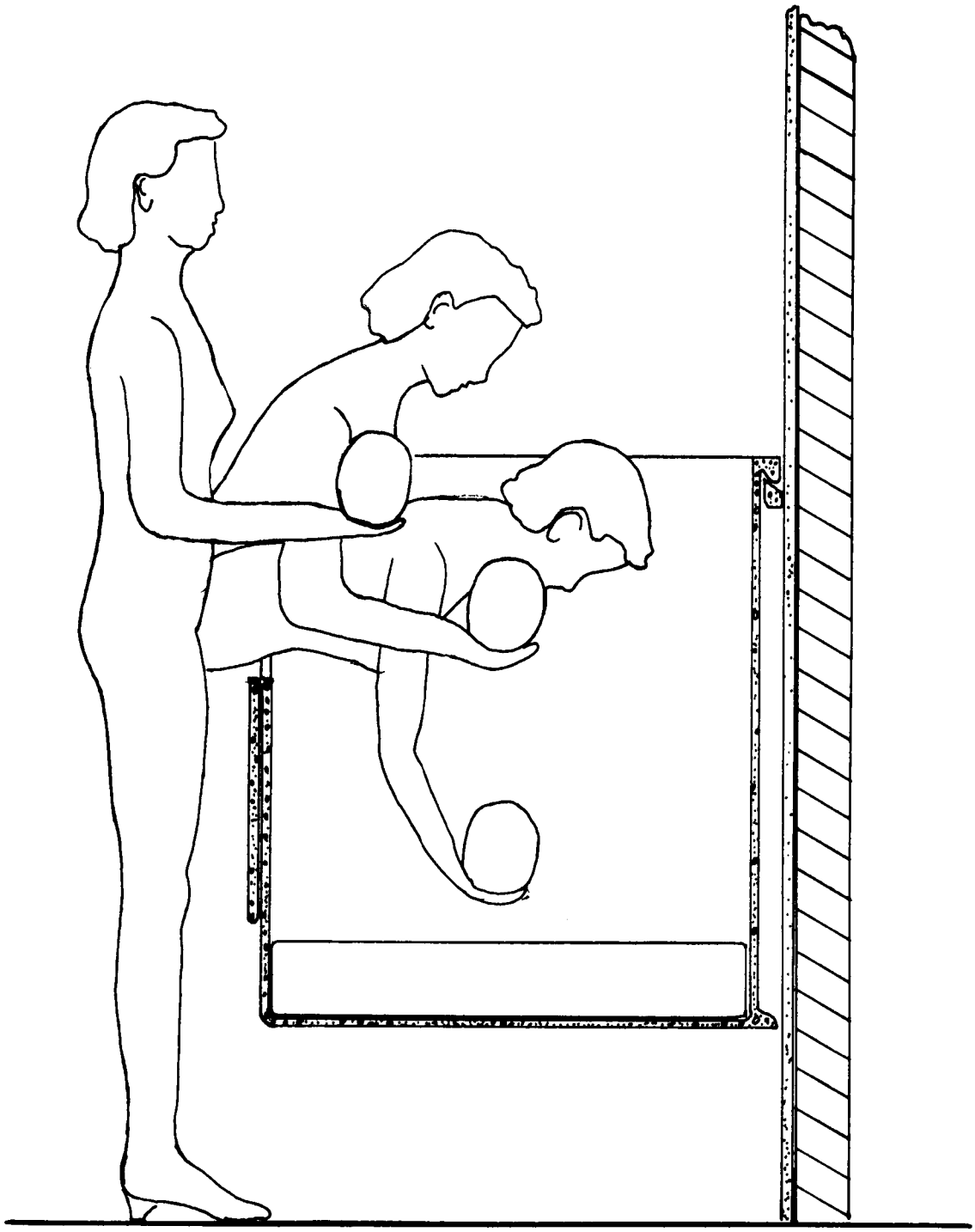


Figure 11. Anthropometrical detail of an adult placing a child in the crib with the dropside down.

placed in the second set of slots from the bottom of the unit for a shelf height of 15-1/2" (Figure 12).

The openings on the sides of the crib were to be core molded as in the highchair-feeding table-toybox unit.[19]

The color would be applied to the crib with a lead-free paint approved by the United States Department of Agriculture. A clear, acrylic coating was specified to be placed on the rails after the paint.[20] The color options for the crib would be yellow, orange, or blue.

The estimated retail price of the multifunctional crib was $110.00.[21]

## IV. YOUTHBED

The advantage of the youthbed was its adjustable height; both a comfort and safety feature for the child. When the youthbed was placed on the first channel, its height was 10-1/2", the recommended height for children four to eight years of age.[22] Because of the varying sizes of children the same age, the bed on the first channel could possibly be used until a child is ten years of age. When the bed was placed on the second track, the height is 16-1/2"; this is

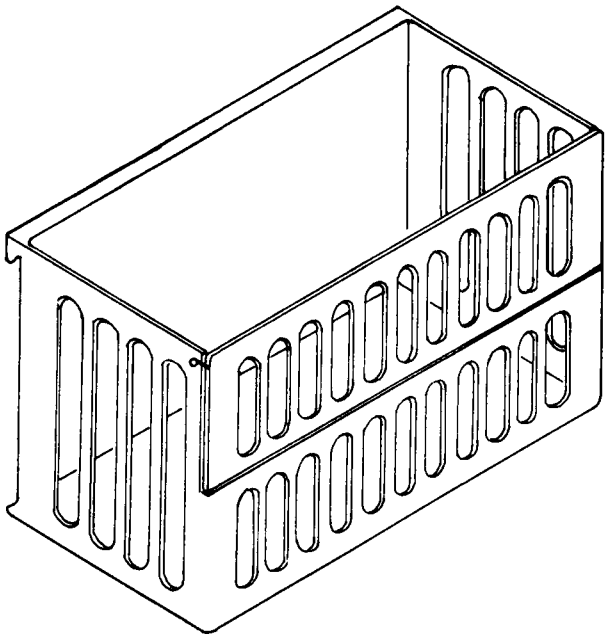
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[19]Smith, June 9, 1973.

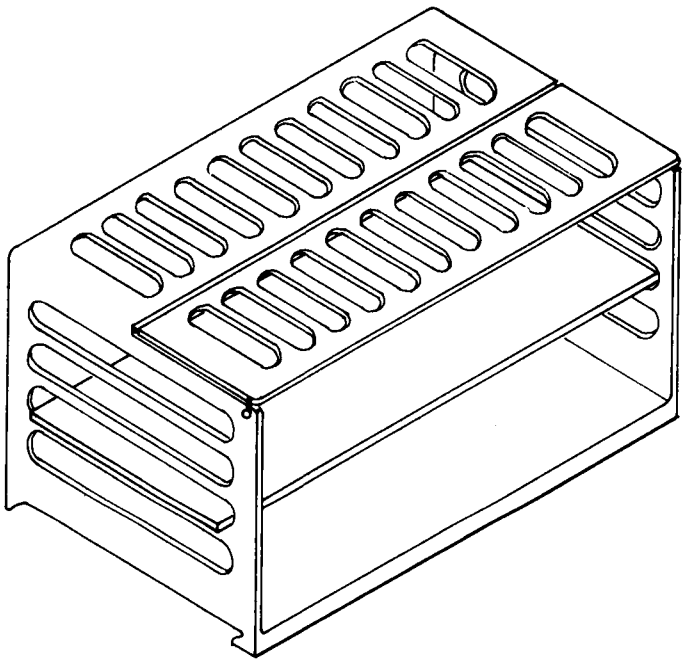
[20]Dunbar, June 16, 1973.

[21]Dunbar, July 12, 1973.

[22]Dreyfuss, chart E.



(a) Crib used as a playpen



(b) Crib used as a shelf unit

Figure 12. Multifunctional uses of the crib.

the suggested height for teenagers, but could comfortably be used by larger children still in the preteenage years.

The youthbed (Figure 13) was designed to have an inside measurement of 33" by 66" and used a medium density 4" polyurethane mattress that fits regular youthbed sheets.

The cost of the youthbed was estimated to be $60.00[23] and it was to be available in orange, blue, or tan.

Even when the child had a regular size bed, the youthbed could be used as a lounging area for reading, studying, or talking on the telephone.

## V. STORAGE DRAWERS

Two designs for drawers were proposed (Figures 14 and 15); one having one drawer and the other two. Both drawers were the same size, 8-3/4" deep, 16-3/4" wide, and 12-1/4" long, to reduce the costs of producing two molds. The size was adaquate for clothing, baby blankets, and folded diapers.

The one drawer unit placed on the first channel could be used as a nightstand when placed next to the youthbed (Figure 16). When raised to the second channel, the top became a table space for a child.

Two of the drawer units could be placed side by side on the second channel to be used as a changing table near the crib (Figure 17).

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[23]Dunbar, July 12, 1973.

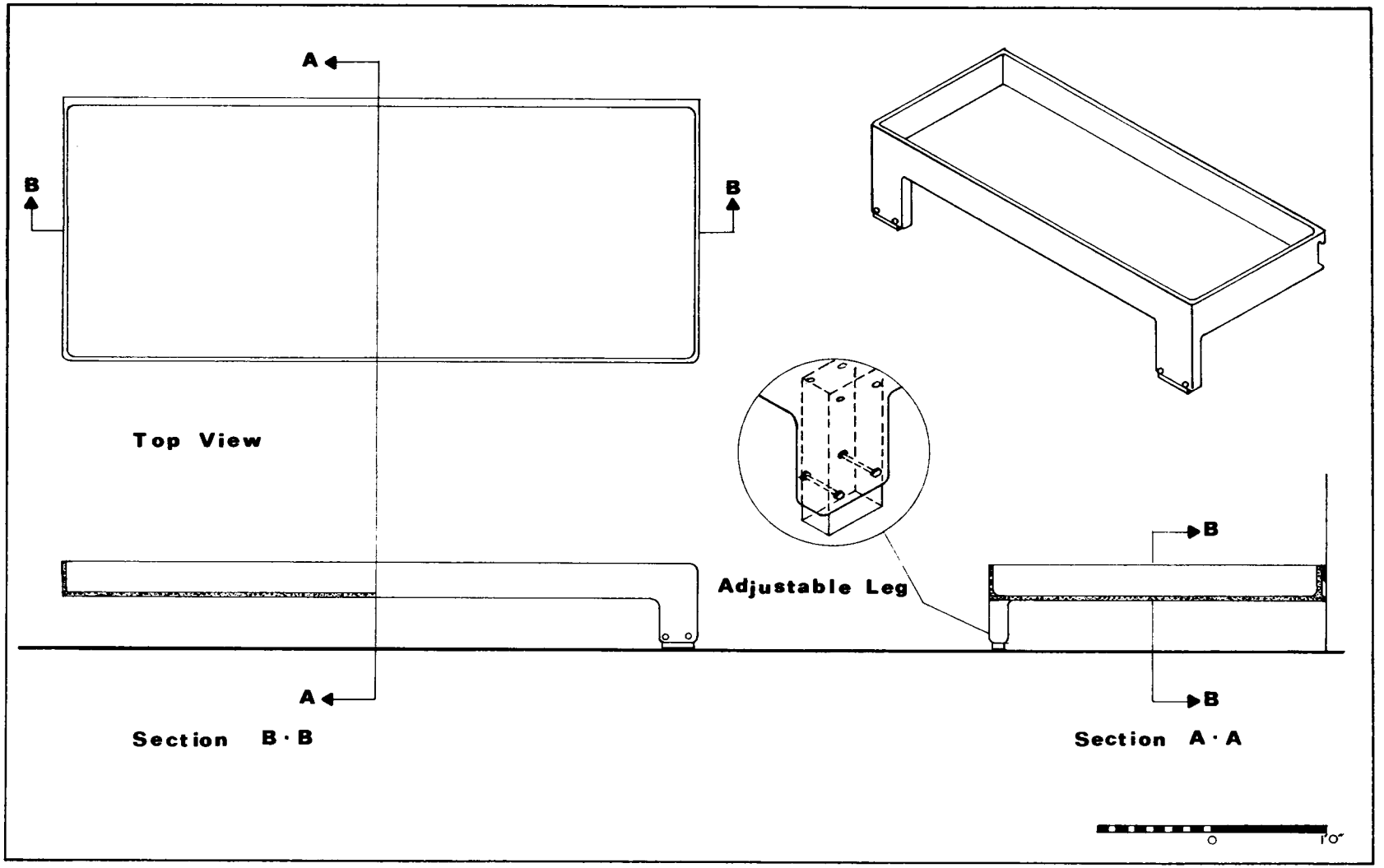



Figure 13. Youthbed.

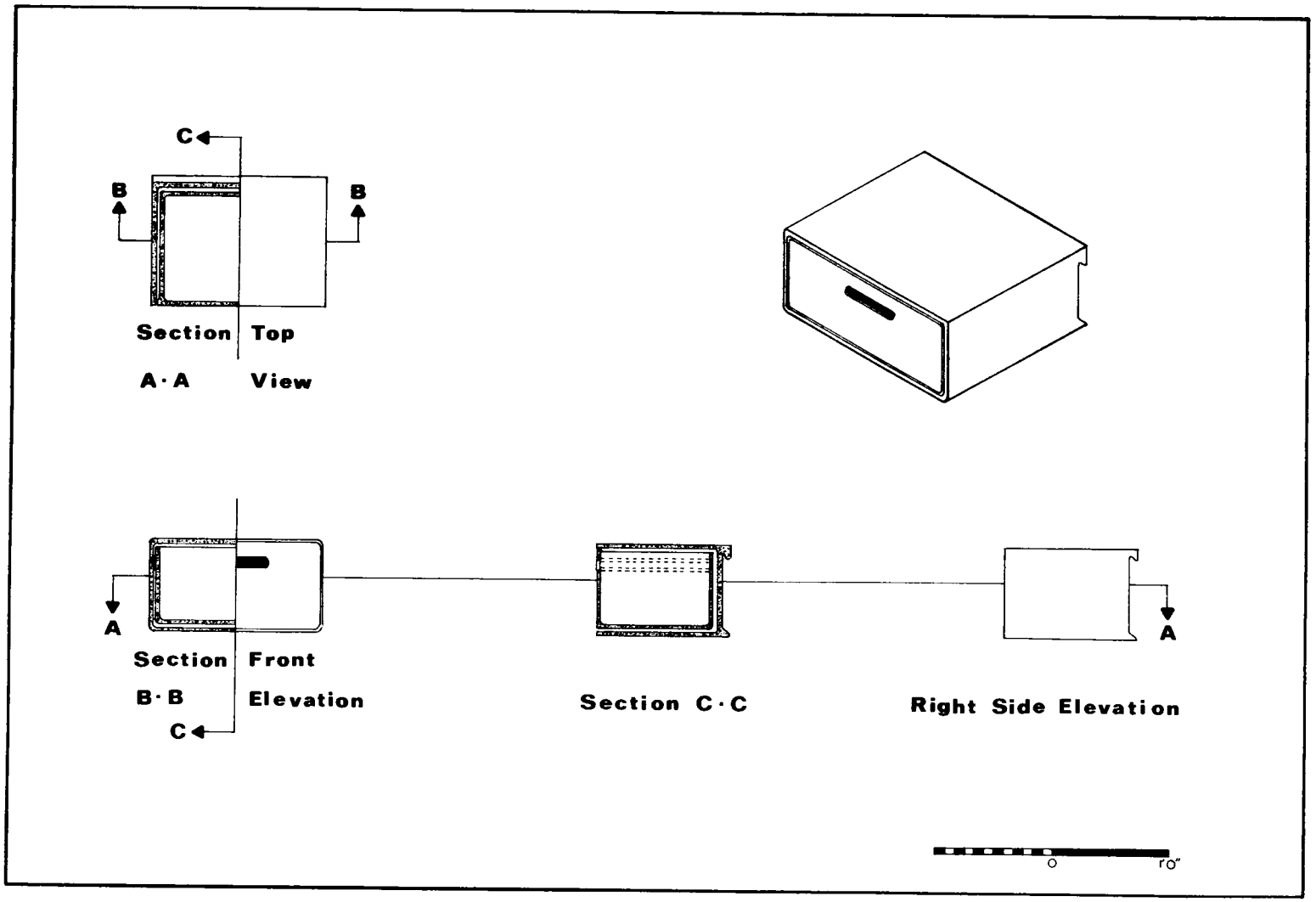



Figure 14. One drawer storage unit.

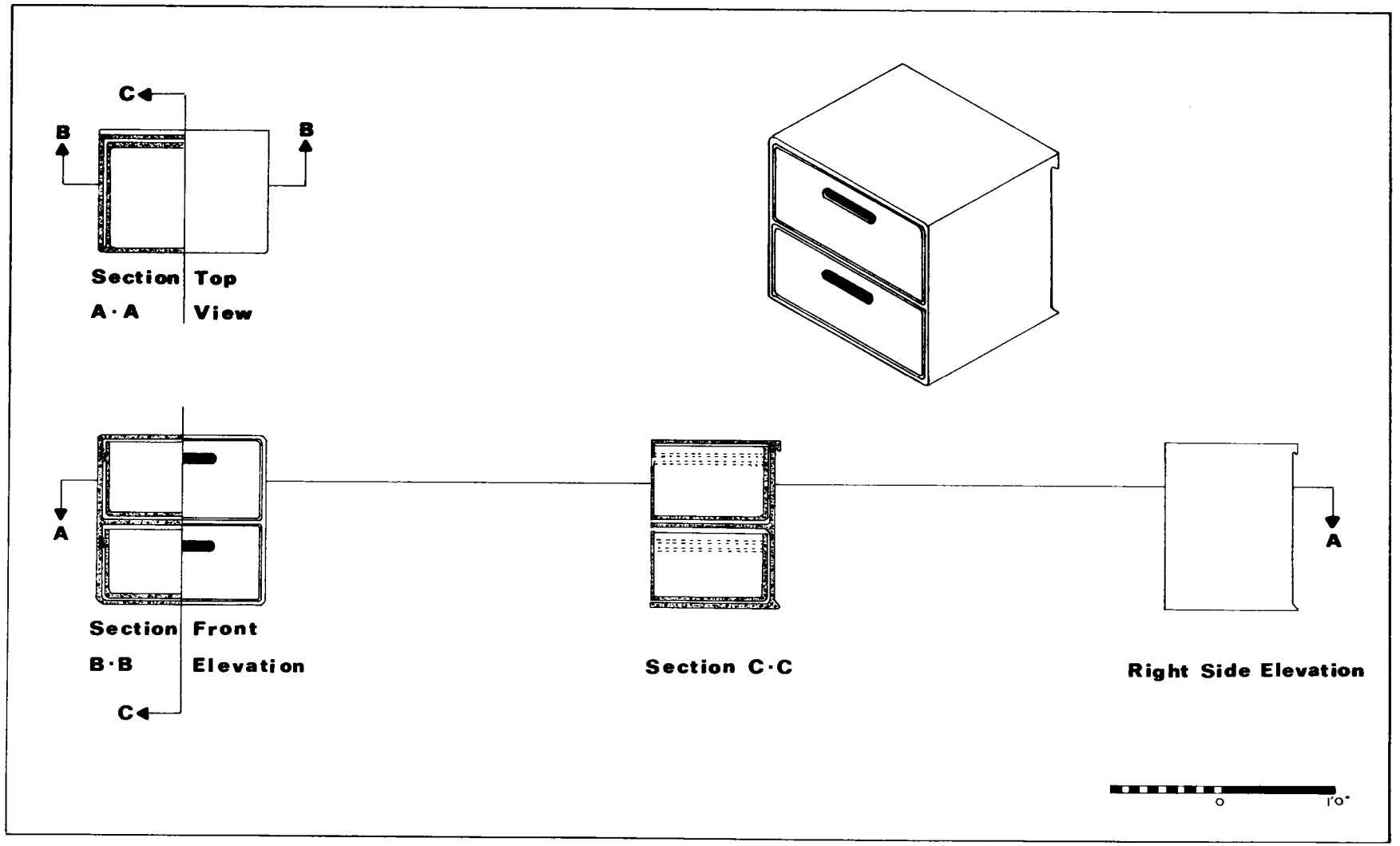



Figure 15. Two drawer storage unit.



Figure 16. Storage drawer used as a nightstand next to youthbed.

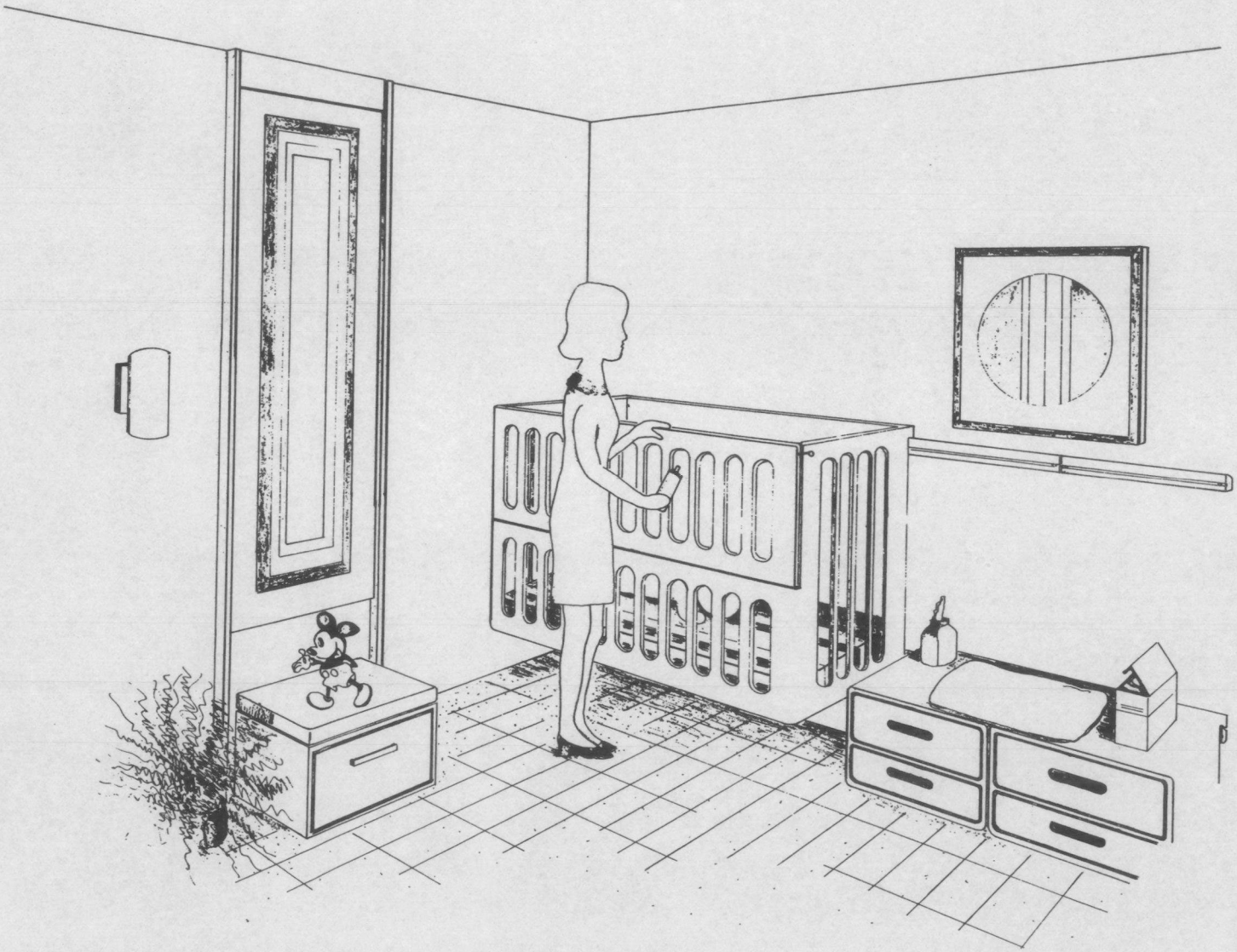


Figure 17. Storage drawers by crib used as a changing table.

The drawers were designed to operate without hardware, only finger grooves. All of the corners were rounded for safety. Only one 18" section of channel was needed for each drawer unit.

Color combinations of orange exteriors with yellow or tan drawers or blue exteriors with yellow or tan drawers were specified. The cost of the one drawer unit was estimated to be $25.00 and the two drawer unit was $40.00.[24]

## VI. SHELF

The shelf (Figure 18) is 36" long and 10-1/2" wide and could be used over the drawers or by the crib to hold toilet articles for the infant. It could be placed over the youthbed, as in Figure 18, to hold book and accessories or by the youthbed as a low shelf. It could also be used as a tray for transporting articles such as folded diapers from the laundry room to the nursery. The uses were only limited by the child's and parent's imaginations.

The shelf, which was estimated retail for $10.00,[25] would be offered in either orange or tan.

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[24]Dunbar, July 12, 1973.

[25]Dunbar, July 12, 1973.

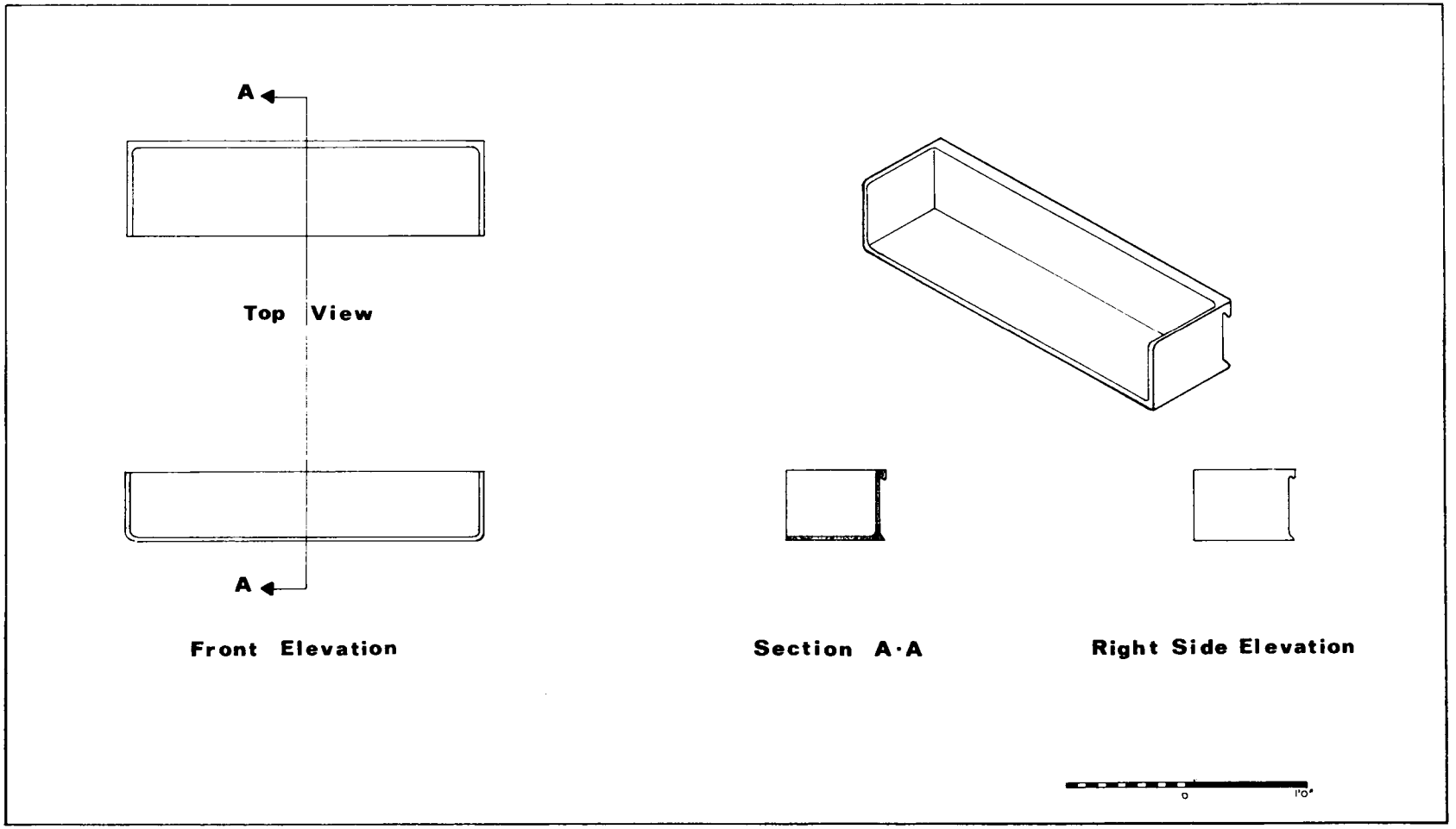



Figure 18. Shelf.

# CHAPTER IV

# SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

## I. SUMMARY

It was the purpose of this study to propose design solutions for plastic, multifunctional children's furniture. A review of multifunctional children's furniture in the United States aided the writer in the planning of the designs. Letters were sent to manufacturers of children's furniture to ascertain whether any multifunctional furniture was on the market, to gather information on designs being produced, and to secure permission to use the photographs of their products. Letters were sent to designers whose multifunctional children's designs had been publicized in periodicals, newspapers, and government pamphlets.

During the actual designing, consultations were held with child development specialists, furniture manufacturers, and the thesis committee to check the practicality of the design solutions.

The primary considerations in the designs were the special requirements for children's furniture, physical characteristics of children, and versatility.

The proposed designs served the needs of eating, sleeping, and storage. The design for eating was based

on the shape of a rectangle with a separate seat that hooked onto a rod on the edge of the rectangle. It could be used as a highchair, a feeding table, or a toybox. The seat could be detached and used with a specially designed supporting structure to become a side chair.

The designs for sleeping and storage consisted of a crib, youthbed, shelf, and two drawers. They were hung from a special channel attached to a wall and could be hung at various heights to meet the requirements of a particular use or age of the child. The wall mounted furniture was based on the shape of a rectangle, and it consisted of one piece construction, with the exception of the drawers and the dropside on the crib. The one piece construction in plastic made the system light weight and easily mobile.

The finalized designs were presented with the use of perspectives and working drawings. Small scale models were made to show the design configurations in three dimensions.

## II. CONCLUSIONS AND RECOMMENDATIONS

The reactions of the manufacturers who were questioned about multifunctional children's furniture were divided into two schools of thought. One was best expressed by Mr. Phil Crossman, Director of Design for Krueger Metal Company in the following statement:

> "No thought is given to the physical needs of children between birth and the age of thirteen years . . . his furniture has sharp corners, improper heights, and poor construction. The attitude of many companies is that this age period is to simply be 'endured' until the child is large enough to use adult furniture . . . it's time that children mounted a little people's liberation front to bring attention to such an oversight in the production of their furniture."[1]

The other division of thought was typified by Mr. Bruce Bristow, Assistant Buyer in Children's Furnishings for Sears, Roebuck and Company in the following:

> "Multifunctional furniture, in general, has not been successful in this country. It sells well in Europe and many such products are available there, but it has never really 'caught on' in the United States."[2]

The positive thoughts towards multifunctional children's furniture came from manufacturers of contemporary furnishings whereas the manufacturers who had been satisfied with offering the same designs, season after season, were negative toward the newer concept. Part of this negativism was because the designs were made of plastic.

> "Despite booming sales, there still exists an undeniable public resistance to plastic. They feel that the very word suggests artificiality. Unfortunately, people associate plastic with cheap, post-World War II toys or the pipes in their refrigerators. Poor design and

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[1]Based on personal correspondence between Mr. Phil Crossman, Director of Design, Krueger Metal Company, and the writer, April 12, 1972.

[2]Based on personal correspondence between Mr. Bruce Bristow, Assistant Buyer, Sears, Roebuck and Company, and the writer, May 10, 1973.

> indiscriminate choice of material and/or method of process have been the reasons for some of the products that have not stood up for consumers. Plastics as a family have been blamed."[3]

Some of the blame should be on the inability of manufacturers of department stores to show people how to put modern furniture together. "You have got to create a total environment and let the consumers walk through it and experience it. You cannot just sell the pieces."[4]

The whole public attitude toward furniture must change to suit changing life styles. Spiros Zakas, a furniture designer, states:

> "Furniture has got to be taken off the status symbol level. It has got to be thought of as functional--it has got to work. I feel plastic-as-plastic will someday be as accepted as wood. Young people will help bring about this acceptance. They are more concerned with function than status."[5]

The writer agrees that in order for the needs of children to be met, furniture must be more functional. The public should be informed of the advantages and uses that multifunctional pieces have in this total concept.

More interest can be generated by magazines and newspapers publishing new designs and concepts in furniture. Exhibits or work by students and winners of design

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[3]"Plastics in the Furniture Industry," Interiors, no. 6, CXXXII (January, 1973), 119.

[4]Ibid.

[5]Ibid.

competitions should be more publicized to increase the interest of the general public.

To aid the writer in carrying out her own suggestions, Mr. Thomas W. Hudson, publisher of Small World, which is one of two publications for the nursery furniture industry, has invited her to prepare excerpts of this study and the design solutions to be published in Small World.[6]

Mr. Walter Brucker, a designer of multifunctional children's furniture, has continued correspondence with the writer during the scope of this study to inform her of his progress in getting his design manufactured. As of May 7, 1973, Mr. Brucker wrote, "The 'Cribed,' alas, is not in production . . . the project has been abandoned as I found it becoming a full time and not very profitable occupation."[7]

It is hoped that more people will become aware of the advantages of plastic, multifunctional furniture, demand that manufacturers offer consumers a choice, and not be satisfied with poor design and construction in their furniture.

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[6]Based on personal correspondence between Mr. Thomas W. Hudson, Publisher of Small World, and the writer, April 17, 1973.

[7]Based on personal correspondence between Mr. Walter Brucker, Director of Interior Design, Charles Luckman Associates, and the writer, May 15, 1973.

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Smith, Ken. Personal interview between Mr. Smith, manager of Decorative Components Division of Polysar Plastics, Inc., and the writer.

Tennessee Department of Public Welfare. Standards for Day Care. Citizen Committee on Day Care Standards, Nashville, Tennessee, 1971.

United States Department of Housing and Urban Development. Focus on Furniture: An Important Element in Housing. Washington: September, 1962.

United States Department of Health, Education, and Welfare. Height and Weight of Children, Public Health Service Publication, no. 1000 (Washington: Government Printing Office, 1970), pp. 3-5.

# APPENDIX

## ADDRESSES OF MANUFACTURERS WRITTEN

Able Marble
38-66 13th Street
Long Island, New York

Advance Design Inc.
45 West 33rd
New York, New York

Architectural Fiberglass
2020 S. Robertson Blvd.
Los Angeles, California

Arneff Furniture Collection
969 Third Avenue
New York, New York

Badger Basket Company
One Park Avenue
Room 316
New York, New York

The Barden and Robeson Corp.
Penn Yan, New York

Becker Furniture Corp.
One Park Avenue
New York, New York

Bilt-Rite Juvenile Products
71 Blaisdell Road
Orangeburg, New York

Broyhill Furniture Industries
Lenoir, North Carolina

Burke-Action Div.
(Tartan Corp.)
5140 N. Westmoreland
Dallas, Texas

George Beylerian, Pres.
Beylerian Ltd.
253 5th Avenue
New York, New York

Century Products, Inc.
2150 West 114th Street
Cleveland, Ohio

Children's Motivational
Environments, Inc.
425 East 52nd Street
New York, New York

Children's Workbench
470 Park Avenue S.,
32nd Street
New York, New York

Child Craft Company
One Park Avenue
Room 306
New York, New York

Childcraft Education Corp.
P.O. Box 94
Bayonne, New Jersey

Childcrafter Center
150 East 58th Street
New York, New York

Childmaster, Inc.
28 Buffalo Avenue
Freeport, New York

Collier-Keyworth
Gardner, Massachusetts

Comfortline
1735 West Diversey Parkway
Chicago, Illinois

Cosco Household Products,
Inc.
Columbus, Indiana

Contempo Associates, Inc.
175 West Bowie Avenue
Rockville, Maryland

Corrado Nursery Furniture
Mfg. Company
140 West 22nd Street
New York, New York

Cross River Products, Inc.
36 Oneida Avenue
Croton-on-Hudson, New York

Croydon Furniture Inc.
41 East 31st Street
New York, New York

Cy Mann Designs Ltd.
979 Third Avenue
New York, New York

Custom Craft
Hickory, North Carolina

Delta Enterprise Corp.
1270 Fulton Street
Brooklyn, New York

Design Media
1266 Ambassador Blvd.
St. Louis, Missouri

Designed by Stacy
82 Willis Avenue
Bronx, New York

Deutsch, Inc.
196 Lexington Avenue
New York, New York

D/R International, Inc.
53 East 57th Street
New York, New York

Drexel Furniture
Box 339
Drexel, North Carolina

Elar Contracting Corporation
4179 Third
Bronx, New York

Edward Axel Roffman
Associates, Inc.
160 East 56th Street
New York, New York

Form, Inc.
12900 W. Ten Mile Road
South Lyon, Michigan

Founders Furniture
Hickory, North Carolina

IV Furniture Corp.
306 East 61st Street
New York, New York

Gendron
411 Richmond Street East
Toronto, Canada

Gerry Designs
P.O. Box 998
Boulder, Colorado

Group 7, Inc.
Waters, Building
Grand Rapids, Michigan

The Hedstrom Company
Bedford, Pennsylvania

L. Hopkins Manufacturing Co.
Lake City, Pennsylvania

International Manufacutring
Co.
2500 Washington Street
Roxbury, Massachusetts

Jamy Manufacturing Co.
P.O. Box 1499
1 Jamy Lane
Kingston, Pennsylvania

Jenkintown Metal Products, In.
P.O. Box 185
Jenkintown, Pennsylvania

John-ee Seat Corp.
47-07 Pearson Place
Long Island City, New York

Juvenile Furniture
Merchandising Service
One Park Avenue
New York, New York

Kantwet Baby Products
Newton, Massachusetts

Kidrest Inc.
143 West 20th
New York, New York

Knoll International
320 Park Avenue
New York, New York

Krueger Metal Products, Inc.
1056 West Mason Street
Green Bay, Wisconsin

Lattoflex
964 Third Avenue
New York, New York

Little Angels Furniture
P.O. Box 368
Jackson, Tennessee

Longacre Furniture Corp.
979 Third Avenue
New York, New York

Joseph P. Miller Co.
444 Central Street
Leominster, Massachusetts

M. Mittman and Co., Inc.
316 East 53rd Street
New York, New York

Modern Manor Inc.
44 West 18th
New York, New York

Mr. W. Kenneth Menke, Pres.
Learning Products, Inc.
725 Fee Fee Road
St. Louis, Missouri

Mobi Corp.
300 West Washington
Norristown, Pennsylvania

N.K.R. Presision Mfg. Corp.
Route 17M
Harriman, New York

Nockonwood Industries
Bloomfield, Iowa

Jack Norman Furniture Ltd.
232 East 59th Street
New York, New York

Nursery Plastics, Inc.
137 East 25th Street
New York, New York

Patina Garray Inc.
964 Third Avenue
New York, New York

Peterson
6904 Tujunga Avenue
North Hollywood, California

Pines of America, Inc.
5120 Investment Drive
Fort Wayne, Indiana

Port-a-Crib, Inc.
Ballwin, Missouri

Pride Products Co.
101 East Alameda Avenue
Burbank, California

Questor Juvenile Furniture
Room 500
One Park Avenue
New York, New York

Mr. B. W. Coltman, Jr., Pres.
Republic Molding Corp.
6330 West Touhy Avenue
Chicago, Illinois

Rotadyne, Inc.
29607 Hall Street
Solon, Ohio

Simmons Company
Juvenile Products Division
New London, Wisconsin

Smith & Watson
305 East 63rd
New York, New York

Southern Furniture
High Point, North Carolina

Spencer and Co.
8730 Santa Monica Blvd.
Los Angeles, California

Stendig, Inc.
410 East 62nd Street
New York, New York

A. H. Stiehl Furniture Co.
28 West 20th Street
New York, New York

Steinbock-Braff, Inc.
768-772 Pacific Street
Brooklyn, New York

Sterling Products
1123 Broadway
New York, New York

The Frank F. Taylor Co.
Old Leestown Road
P.O. Box 636
Frankfort, Kentucky

Thayer, Inc.
Gardner, Massachusetts

Thayer Coggin, Inc.
South Road
High Point, North Carolina

Thomasville Furniture
Industries
Thomasville, N. Carolina

The Toidey Co.
4320 Ardmore Avenue
Fort Wayne, Indiana

Trimble Products, Inc.
Southern Pines, N. Carolina

Village Manufacturing Corp.
P.O. Box 248
Pleasanton, California

Wallach Liebhold
P.O. Box 169
Harrison, New York

Welsh Company
1535 South 8th Street
St. Louis, Missouri

Young Years
12 Station Street
Brookline, Massachusetts

# LETTER TO FURNITURE MANUFACTURERS

481 Broome Road
Apartment 301
Knoxville, Tennessee 37919

Gentlemen:

As an interior design student at The University of Tennessee, Knoxville, I am inquiring about the current status of children's multifunctional furniture--its design and safety features--for my thesis. My interest is in the outstanding features of your furniture that are promoted by your company and in knowing if any multifunctional furniture is manufactured.

Your answers will be compiled in the thesis as a reference for the general public, child development and design students and faculty.

If possible, it would be beneficial to have pictures and an approximate suggested retail price of your highchair, crib, playpen, and any multifunctional furniture.

Any assistance that you may give will be appreciated.

Sincerely,

Sonya B. Kelley

Enc.

# QUESTIONNAIRE SENT TO CHILDREN'S FURNITURE MANUFACTURERS

What does your company consider the outstanding features of its children's furniture?

What are its safety features?

Were the appropriate sizes determined by testing or by an anthropometrical study?

Suggested retail prices:

A) Crib

B) Youthbed

C) Highchair

D) Playpen

E) Table and chair

# ADDRESSES OF DESIGNERS

Walter T. Brucker
Director of Interior Design
Charles Luckman Associates
9220 West Sunset Blvd.
Los Angeles, California

Mario Dal Fabbro
1251 Tacoma St.
Allentown, Pennsylvania

Michael Koulermos
c/o McCann Erickson
485 Lexington Ave.
New York, New York

Conrad Levenson
157 East 35th St.
New York, New York

Ed Secon
350 East 77th St.
New York, New York

# VITA

Sonya Batchelor Kelley was born in Haleyville, Alabama, on November 18, 1947. She graduated from Winston County High School in Double Springs, Alabama, in May, 1966. The following September, she entered the University of Alabama in Tuscaloosa, and in May, 1970, received a Bachelor of Science degree from the School of Home Economics with a major in interior design.

In June, 1970, she began working in Macon County as a home agent with the Alabama Cooperative Extension Service.

In September, 1971, she received a graduate assistantship from the Department of Related Art, Crafts and Interior Design at The University of Tennessee. She worked toward her degree until August, 1972. At this time she began working with Miller's in Knoxville, Tennessee, as manager of the interior design department. She received her Master's degree in Related Arts, Crafts and Interior Design with a major emphasis in interior design in August, 1973.

She is married to Kerry Lynwood Kelley from Carbon Hill, Alabama.