

Technical note

An economic cushioned seat of variable easily adaptable configuration for cerebral palsied children

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Abstract

This paper describes a low cost cushioned seat of variable configuration for cerebral palsied children in the 5 to 10 year age bracket.

Economic considerations are presented and the manufacturing process is described. It is believed that the system has advantages specially related to socio-economic conditions prevailing in a developing country.

Introduction

Several seating systems have been designed for cerebral palsied children (Ferguson-Pell and Paul, 1981). These include:

- moulded or vacuum-formed custom shaped shells
- shapeable matrices from interlocking injection-moulded components
- foam in place and foam in box
- parapodia and other standing support devices.

This paper describes the design philosophy and objectives for a special cushioned seat of variable configuration for cerebral palsied children in the 5 to 10 year age bracket. In view of the socio-economic conditions prevailing in a developing country like Argentina, a low cost design was a fundamental consideration in the development of the "IMA 509" Seat described in this publication*.

IMA Seat "509" — Design factors

Clinical

The two major clinical factors which must be considered in designing a seat for cerebral palsied children are: fixed skeletal deformities and pathological reflexes.

Cerebral palsied children are normally

characterized by the predominance of spasticity, athetosis or hypotonicity.

Children with scoliosis, pelvic obliquity or other structural asymmetry must be provided with a seating system contoured to accommodate their irregular shapes.

A "custom seating" system has both seat and back specially shaped. A basic weakness, for instance in the moulded seating concept is the fact that it relies upon the hypothesis that a seat shape determined in the clinic on one day will be comfortable and clinically acceptable for an extended period thereafter (Ferguson-Pell and Paul, 1981). From this viewpoint a variable geometry seat which permits a wide range of parameters to be adjusted to find an optimum configuration for the disabled is highly desirable (Holte, 1983).

Technical and socio-economic

A basic design parameter in a developing country is low cost. This requires fabrication with materials readily available in the developing country. In Argentina high ductility aluminium plate, polyurethane foam and a non-toxic paint* fell into this category.

Other parameters taken into account were:

- usefulness to a large population of disabled children
- simplicity in construction in order that it may be fabricated by disabled workers or even members of the family of the children affected by cerebral palsy
- versatility to allow for (a) manual transportation (b) attachment to an automobile seat and (c) mounting on a standard wheelchair.

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* The development described resulted from collaboration between the "Instituto de Mecánica Aplicada" (IMA) and the School for Retarded Children No 509, Bahía Blanca.

** A roof covering paint was used with good results.

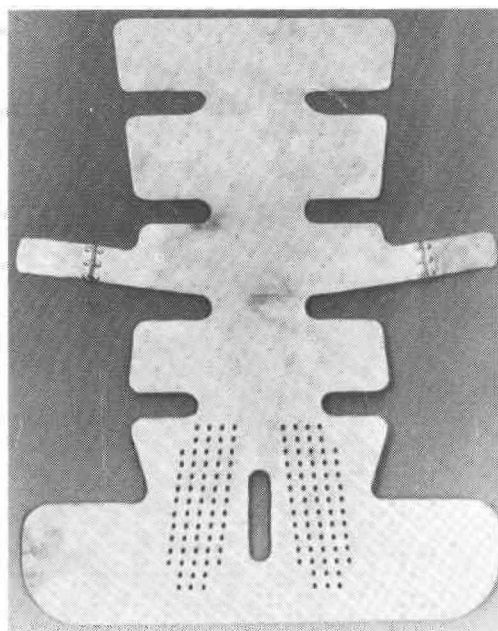


Fig. 1. Aluminium frame.

Manufacturing process

It is possible to obtain three aluminium "skeletons" from an aluminium plate of 1×2 m (1.5 mm thick) commercially available in Argentina.

Figure 1 shows the detail of a single aluminium frame. Holes are bored in the lower portion to permit ventilation of the foam.

The jointed arms are designed in such a manner that waist straps can be secured to them as shown in Figure 2. The waist straps mould around the patient's trunk for support when properly positioned.

The polyurethane foam is cemented to the aluminium plate with a commercially available adhesive.

Successive paint coatings are applied once the basic seat geometry has been adjusted to the patient (Figures 2 and 3).

Preliminary results and conclusions

Results obtained so far with the IMA 509 seat are satisfactory.

The cost of a single seat is approximately \$100 (US) which is considerably lower than seats commercially available in highly industrialized countries. At the same time as

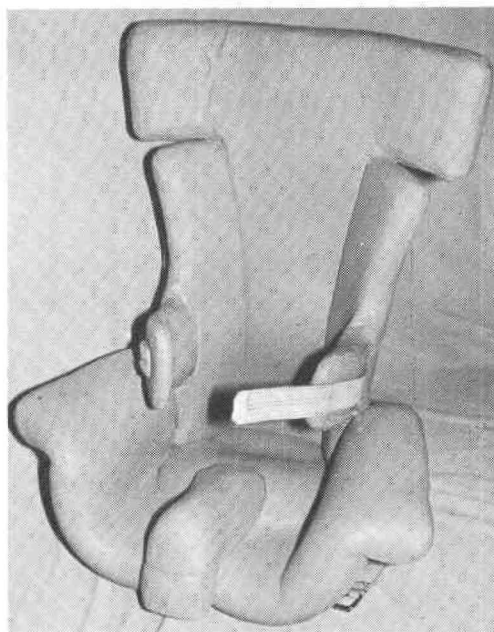


Fig. 2. Front view of the IMA 509 seat.

can be appreciated in Figures 2 and 3 the IMA 509 variable configuration seat is aesthetically pleasing.

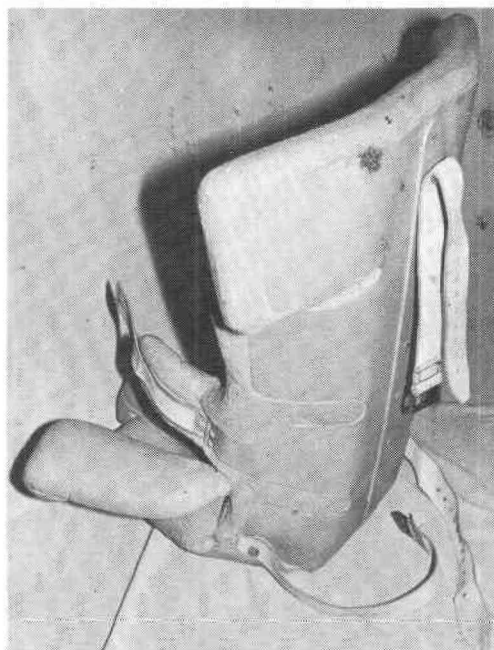


Fig. 3. Side view.

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