CHAPTER 3
STRETCHER DESIGNS REVIEW

Introduction
To transfer the knowledge of existing products design to new product to be developed, literature study is very important and essential because it not only gives design concepts but also gives an insight of their advantages, limitations and enlightens the designer’s thinking towards innovative concepts generation. The development time, cost and resources can be saved by reviewing the related literature and product at initial design stages.

3.1 History of the Stretcher:
In 1899, Sir John Furley supported the design of the Furley stretcher and the Ashford litter which was a basic stretcher with canvas cover and wheels. It came in use during 1st World war. The Furley stretcher was established as foundation for the development of the stretcher. In 1905, Charles Stokes invented the Stroke stretcher and got it patented in 1906 and it could be used as a stretcher and splint. In 1906, Neil Roberson the fleet surgeon developed a stretcher (Neil Roberson stretcher) evolved to overcome the problems specific of confined space rescue and it gave good services during the 1st and 2nd world war and still in use. In 1914, Kirker developed the “Kirker Ambulance Sleigh” Specially adapted for use on board ships for mines injury persons. Dr Donald Gordon Duff developed the Duff stretcher during the 1950s and 1960 and few were taken on the British Everest expatriation in 1953. Then in 1961 the Perche- Piguillem stretcher came into existence and it was adapted for winch rescue. In 1967 peter Bell developed the hood style head cages as per Thomas stretcher’s dimensions.

There were various version of Bell stretcher e.g. Mark 1 to 3 and made from stainless steel tubes and fitted with folding handles were introduced in the year of 1972. There was an introduction of Superlite, the one piece aluminum stretcher provided with 70 mm runner and four leg lift harness in 1979. Afterward in 1995 Peter Bell constructed new Thomas style stretcher. Figures (3.1 a – 3.1j) show the various designs of the stretcher.
3.2 Stretcher Designs Review:

The stretcher is being used since early 19th century by mountaineers besides the military application. John Niles Robertson developed a stretcher in year 1906 and many designs were followed (Frontier Medical 2010). There are many companies worldwide which are...
manufacturing the stretcher. Designs of the stretcher depend upon many factors such as nature of casualty, evacuation methods, climate/terrains and mode of transport.

Table 3.1: Summary of patented stretcher designs

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<th>Single Fold Stretcher Design</th>
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<td>1) Single Lateral Fold Stretcher</td>
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<td>2) U-Shaped Frame Foldable Stretcher</td>
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Therefore an effort is made to study the various designs of the stretcher to understand the frame design, folding mechanism, stretcher lifting mechanisms, material and various dimensions in addition to their advantages and limitations. The product review is divided mainly into two categories as under:
3.2.1 Patented stretcher designs
3.2.2 Commercially available Stretchers

3.2.1 *Patented stretcher designs*:
Since long back (1899) the efforts were given to design the stretchers and filing their patents and also got patented. Few of the patented designs as shown in table 3.1, were selected to study their advantages and limitations. The foldable stretcher can be divided into two main categories as single fold and double fold stretchers.

3.2.1.1 *Single fold stretcher designs*:
Single fold stretchers or normal stretchers are the simplest type of the stretcher. They are made of two poles with a cloth stretched between the poles. These can be folded either in lateral or longitudinal direction and the description of few designs of single fold stretcher is given as under:

1) *Single lateral fold stretcher*:
The single fold Stretcher design comprises two longitudinal profiles (3- Main beam) between which a stretcher sheet/fabric (2- fabric) is stretched, main beam being provided with brackets (5-runner) between which spreader bar (4- spreader bars sub assembly) are provided for transversal stiffening), the runners being provided with through openings (7, 8) for insertion of leg and support members securable by the aid of clamping screws.

![Figure 3.2: Single lateral fold stretcher](image)

The self weight of the normal Stretcher is around 14 kg and folded length is approximately 1.2 meter. One such Stretcher is shown in figure 3.2
2) **U-Shaped frame foldable stretcher:**

This design of foldable stretcher includes a pair of U-shaped frame members hinged and connected together to permit folding of the stretcher as shown in figure 3.3.

![Figure 3.3: U-Shaped frame foldable stretcher](image.jpg)

A flexible support panel is secured to the U-shaped frame sections and is provided with recesses or cutouts adjacent the corners and hinge connections of the stretcher to facilitate carrying thereof.

3) **Battens stretcher:**

The Battens stretcher comprises a frame having side members (main beams) supported above ground level, as by legs, and flexible battens each having a series of holes at one end so that a batten may be slid under a body without disturbing the posture and one of the holes engaged with a spigot on one side member.
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