April 15, 1969 M. ANDERSON ET AL 3,438,068

SELF-TUCKING FITTED SHEET

Filed June 23, 1966

FIG. 1.

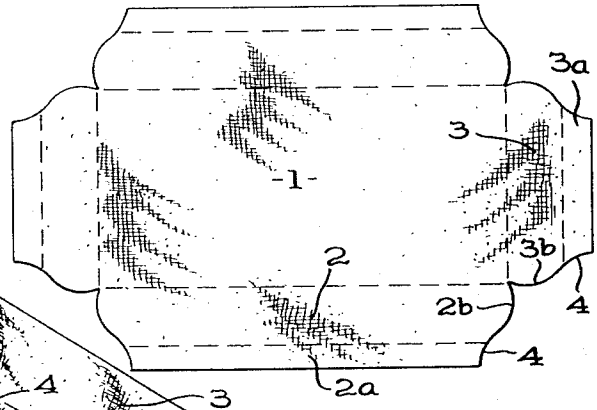
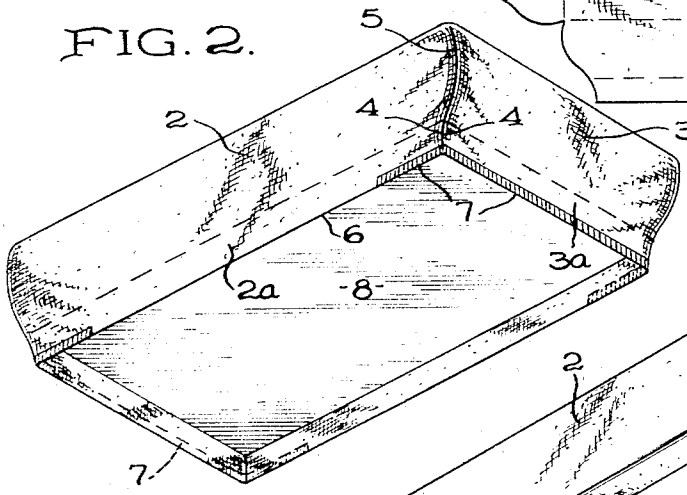


FIG. 2.



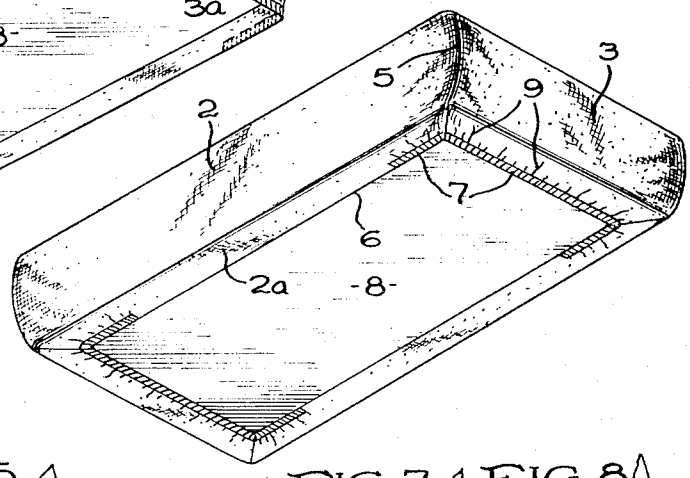


FIG. 3.

FIG. 4.

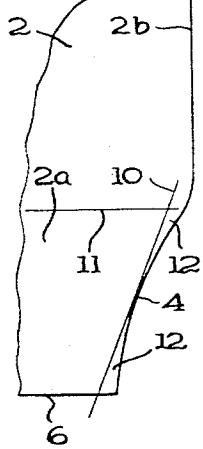


FIG. 5.

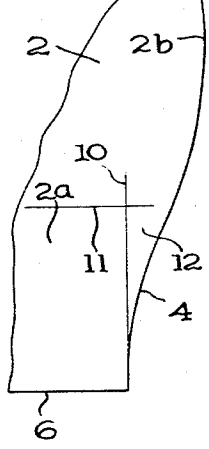


FIG. 6.

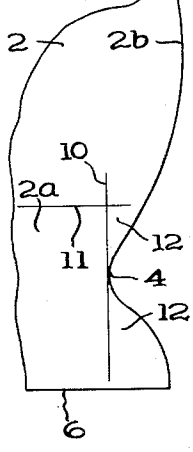


FIG. 7.

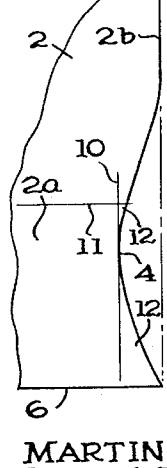
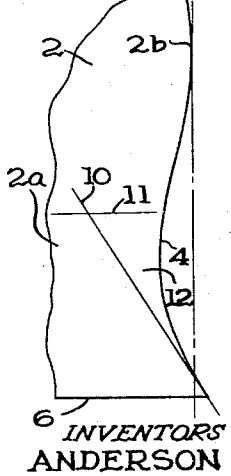


FIG. 8.



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3,438,068

SELF-TUCKING FITTED SHEET

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Continuation-in-part of application Ser. No. 343,296, Feb. 7, 1964. This application June 23, 1966, Ser. No. 559,784

Int. Cl. A47g 9/04

U.S. Cl. 5—334 14 Claims

ABSTRACT OF THE DISCLOSURE

This invention is directed to a fitted sheet with evenly tensioned linear elastic means attached to the corners and ends of the sheet's free edge. Where fullness is mitered out in the construction of the sheet, a maximum of edge fullness is retained through the provision of curvilinear corner seams including a portion of concave curvature.

This invention relates to fitted covers, sheets, or the like and, more specifically, it relates to a fitted cover having tensioned linear edge elastic means.

In our patent, 3,020,566, issued Feb. 13, 1962, we described a self-tucking fitted sheet having differentially tensioned elastic means whereby fullness remaining under the mattress after the fitting of the sheet might be taken up in corner gathers. As an improvement thereover, in our copending application Ser. No. 343,296, filed Feb. 7, 1964 and now Patent No. 3,273,175, the present application being a continuation-in-part thereof, we disclosed that by providing corner seams, formed from seam edges of cut-out corner portions of a blank, with a concave curvature in the mattress bottom- or mattress bottom edge-enfolding portion, there results a cover possessing optimum fitting properties while avoiding excessive strain of edge elastic, cover edge, and corner seams. The concave curvature of the corner seams minimizes bottom fullness and maximizes edge fullness, thus permitting the most convenient fitting possible to obtain with tensioned linear elastic means.

The prior art shows two divergent practical approaches to an effective combination that includes elastic means in a fitted cover or the like. The two resulting classes are as follows with reference to relevant representative patents.

Class I

The provision of elastic inserts such as gores, gussets, or the like, in combination with the panels of the cover.

(A) Corner inserts—
Shauer, U.S. Pat. 2,162,755
Harris, U.S. Pat. 2,624,893
Steffinich, U.S. Pat. 3,013,283
Cobb, U.S. Pat. 3,114,156

(B) Side and/or end inserts—
Goodson, U.S. Pat. 3,142,072

Class II

The provision of linear edge elastic means in combination with the free edge of the cover.

(A) Evenly tensioned elastic—
(1) Corner, including corner and end, edges only—
Schreiber, U.S. Pat. 2,139,698
Nail, U.S. Pat. 2,904,103
Barnes, U.S. Pat. 3,111,688
Barrett, British Pat. 701,899
Mulliez Freres, French Pat. 1,185,622
(2) End edges only—
May, U.S. Pat. 2,942,280
Hester, U.S. Pat. 2,994,094

(3) The entire edge—
Fry, U.S. Pat. 1,996,575
Coldren, U.S. Pat. 2,191,956
Kessler, U.S. Pat. 2,528,313
Black, U.S. Pat. 2,569,627
Kurland, U.S. Pat. 2,696,872

(B) Differentially tensioned elastic—
Anderson, U.S. Pat. 3,020,566

This invention is directed to improvements in class II type covers, which, as exemplified above, are most commonly formed, when intended for a mattress or the like, from a cruciform blank with excess fullness having been mitered out. While square mitered blanks were satisfactory when the elastic was to be attached to the entire free edge, the teaching of the art prior to our copending application has been that with any lesser length of elastic it is essential to remove fullness in inverse proportion thereto, including predominately edge fullness. In such covers, prepared from cruciform blanks, the seam edges of the symmetrically cut-out corners may be described as varying from double-beveled to continually inwardly curved. In every case the lower portion of the seam edge is substantially convex. When the adjacent seam edges are united, the free edge of the cover is at best just marginally sufficient to extend over any one mattress corner.

It can thus be appreciated that in the experience of the art it was considered by those skilled therein that since the fullness taken up by edge elastic must predominately be edge fullness, it is such edge fullness which must accordingly be mitered out. Contrary to this teaching of the art, we have discovered, as set forth in our copending application, that by the retention, rather than the removal, of edge fullness when removing excess flap or bottom fullness, there may be formed a cover wherein, surprisingly, edge elastic will take up the retained edge fullness and permit a snap-on or self-tucking effect.

The present invention is concerned, in part, with specific improvements in the sheets or covers of our copending application, now U.S. Patent 3,273,175, which is incorporated herein by reference. In one such improvement, there is generically provided a cover having edge elastic means comprising substantially evenly tensioned linear corner and end elastic elements. Another improvement of this invention comprises, in a cover including corner and end elastic means in combination with the free edge of the cover, differential fullness whereby the fullness available to the free edge will be at least not substantially less than the fullness available to that portion of the cover encompassing the periphery of a mattress or the like. In a further aspect of the present invention there is included, in a mattress cover or the like, elastic means comprising linear corner and end elastic means in combination with a free edge having fullness at least substantially equal to the fullness available to the mattress periphery-encompassing portion of the cover, the edge fullness thereof being substantially all contained by corner and end gathers when the elastic means are relaxed, in combination with the edge, upon the mattress. This invention also provides, as a further specific improvement, a fitted sheet having differential corner fullness and a free edge in combination with linear edge elastic means consisting solely of an even number, not in excess of four, of discrete separate linear elastic elements with each elastic element being attached to at least one corner segment of the free edge.

Other objects and advantages of the present invention will be apparent from the following description, with reference to the accompanying drawings, presented by way of example and not in limitation of the present invention.

In the drawings, wherein like indicia refer to like parts:

FIGURE 1 is a plan view of a blank from which a cover embodying this invention may be made.

FIGURE 2 is a perspective view of a cover of this invention with the cover shown as fully extended over a mattress.

FIGURE 3 is a perspective view of the cover of FIGURE 2 as fitted to and relaxed upon a mattress.

FIGURES 4, 5, 6, 7, and 8 are, respectively, detailed plan views of a portion of the panel, flap, and seam edge of certain preferred exemplary embodiments of this invention.

In FIGURE 1 there is shown as one preferred mode of practice of this invention a blank from which a sheet of the invention may be made. The blank is preferably cut from a rectangular piece of sheet material. Top, side, and end panels **1**, **2**, and **3**, respectively, substantially conform to the top, side, and end contours of the mattress to be fitted; while side and end flaps **2***a* and **3***a*, respectively, extend from the lower edges of respective associated side and end panels **2** and **3** and are adapted to underlie the mattress bottom. Each respective side and end panel **2** and **3** with its respective associated side and end flap **2***a* and **3***a* have curvilinear seam edges **2***b* and **3***b*, respectively, which define symmetrically cut-out corner portions of the blank with each of seam edges **2***b* and **3***b* having a curvilinear segment **4** of concave configuration. As shown in FIGURE 2, adjacent seam edges **2***b* and **3***b* are united, by any convenient means, to form curvilinear corner seams **5**, thereby also forming an endless free edge **6**. The joined symmetrical concave segments **4** form a seam segment of concave curvature, or concave indentation, and cooperate in positioning the sheet upon mattress **8**, while the corners of free edge **6** depend therebelow with the periphery of the free edge being quite sufficient to permit fitting without substantial strain or distortion of either mattress or sheet. In the illustrated embodiment, the corner seam concavity will function in positioning the sheet independently of the elastic means. When free edge **6** is removed from mattress **8**, seams **5** can be doubled over at concavities **4** and the entire corner peeled over the mattress much as a sweater is removed. This obviously results in minimum strain upon seam **5**. Tensioned linear edge elastic means **7** are attached to the corresponding corner and end segments of free edge **6** by any convenient means. When the sheet of this invention is relaxed upon mattress **8**, it will appear as shown in FIGURE 3 with the edge fullness being taken up in gathers **9**. Upon extension of elastic means **7**, the gathers **9** susbtantially disappear and the sheet is readily fitted or removed and may indeed even be applied with a person lying upon the mattress, as is necessary in a sheet for hospital use.

This invention may be further and more explicitly defined with respect to the several embodiments of FIGURES 4, 5, 6, 7, and 8, each respectively showing a detailed plan view of a portion of one side panel **2**, its associated flap **2***a*, and seam edge **2***b* common thereto. The adjacent end seam edge **3***b* (not shown) will, in these embodiments, be a mirror image of seam edge **2***b*. In further definition of these embodiments of our invention, at least one extended tangent line **10** may be drawn to curvilinear concave segment **4** of seam edge **2***b*. The tangent line **10**, as drawn, must be so as to transect each of free edge **6** and a straight line **11**, which may be drawn between panel **2** and flap **2***a*, without the tangent line transecting any portion of seam edge **2***b* between line **11** and free edge **6**. Since curvilinear segment **4** is concave, there will desirably be a portion **12** of flap **2***a* lying within an area bounded in part by lines **10** and **2***b*. It can be seen that a number of permitted tangent lines may be drawn within the definition as above discussed. However, in certain constructions of the sheet of this invention, there will be one extended tangent line which may be drawn substantially perpendicular to line **11**. In another

desirable construction, a portion of the tangent line may be substantially coincident with a portion of concave segment **4** of seam edge **2***b*. It is often preferred to have such possible coincident portions mutually transect edge **6**.

The embodiments of FIGURES 6, 7, and 8 are further illustrative of a surprising and unexpected discovery of another aspect of the present invention. It is readily apparent from the examination, respectively, of each of FIGURES 6, 7, and 8 that, with the fullness available to the corner segments of free edge **6** at least being greater than that available to the respective corners of flap **2***a* and not substantially less than that available to the respective corners of panel **2**, upon full extension of elastic means **7** (with reference to the description above and FIGURE 2) and the substantial disappearance of gathers **9** (of FIGURE 3) corner seams **5** will have, as exemplified at **4**, a concave curvature. This teaching is clearly independent of the modes of practice hereinabove discussed. Thus, covers according to this latter aspect of our invention may be constructed from more broadly generalized cruciform blanks of appropriate configuration providing, upon fabrication of the cover from the blank, that the fullness available to the corner and end edge segments will be at least: (1) greater than the fullness available to the respective corners and ends of the endless flap portion, and (2) not substantially less than the fullness available to the respective corners and ends of the mattress-encompassing side and end panels united by the corner seam. Because of this differential fullness, the corner seams will then have a segment which can be concavely curved or indented upon full extension of the elastic means when the cover is fitted over the mattress.

The differential fullness, in the illustrated embodiments above discussed, with reference to the cover as applied to a mattress, may be evidenced by a corner seam segment of approximately sigmoid curvature comprised of a lower portion of concave curvature in combination with an upper mattress corner-conforming portion of convex curvature. Such a sigmoid configuration is particularly desirable in mass-produced commercial sheets which must be capable of fitting mattresses of quite variable dimensions. The unique sigmoid curvature rather surprisingly provides a potential material reserve available about three axes of a mattress corner, thus readily accommodating to mattresses of varying size.

When referred to herein, the fullness discussed is to be understood as generally defined in accordance with the art-accepted meanings of that term. With reference to the accompanying drawings, the meaning is, of course, quite obvious. Differential fullness may be imparted to the cover of our invention by convenient or appropriate means including, by way of example, the seam edge contours above disclosed, the provision of bias-cut corner and/or seam edges, combinations thereof, etc. The differential fullness is further defined herein, for purposes of clarity, in terms of the operative properties conferred thereby upon the cover when applied to a mattress as, for example, the various curvatures functionally evidenced by the corner seams as discussed hereinabove. Where the corner edge fullness is operatively defined as being at least: (1) greater than the corner flap fullness, and (2) not substantially less than the corner united panel portion fullness, there is obviously and exactly set forth a statement of differential fullness which may be demonstrated in the fitting of the cover by a corner concavity or indentation, such as a substantially sigmoid or a continuously concave curvature of the corner seams, with the seam curvature (with illustrative reference to FIGURES 6, 7 and 8) as a direct function of the fullness returning, at the edge, at least very nearly to that of the panel portion. There is thus achieved a cover having the convenience of an open-box type cover and the hereinabove recited advantages of the differential fullness in combination with linear edge elastic means. In another aspect of

our invention, as also shown in FIGURES 6, 7, and 8, (with illustrative reference to FIGURE 3) we have found it often desirable to provide covers wherein the fullness available to the corner and end edge segments is approximately substantially equal to the fullness available to the corresponding corner and end portions of the united side and end panels, the edge fullness thereof being substantially all contained by corner and end gathers when the cover is relaxed upon the mattress.

Where we have above referred to the corner edge fullness of the cover of our invention, this is to be understood as a property inherently in the corner construction of the disclosed preferred embodiments of the invention, but in combination with linear corner and end elastic means being operatively describable as corner and end edge fullness. The fullness available to the corner or corner and end edge, from whatever construction thereby provided, is that fullness evident upon or furnished by full extension of the elastic means attached to the cover edge and in cooperation therewith. The elastic means of the invention, in its above discussed aspects, will desirably comprise substantially evenly tensioned continuous corner and end elastic means such as elastic bands, tapes, strips, or the like.

In yet another more specific aspect of our invention, the elastic means will consist solely of a small even number of discrete separated elastic elements with each elastic element being attached to at least one of the four corner segments of the free edge and no more than one elastic element being attached to any one corner segment thereof. The discrete elastic means are attached to the free edge of a sheet or cover possessing differential fullness as above defined with particular respect to FIGURES 6, 7, and 8, or alternatively defined, with respect thereto, in that the fullness available to each of the four corner edge segments will be at least: (1) greater than the fullness available to the respective corners of the endless flap portion, and (2) not substantially less than the fullness available to the respective corners of the united side and end panels. As is obvious from the drawings and the foregoing discussion, to say that the corner edge fullness is at least not substantially less than the corner panel fullness is equivalent to saying that the corner edge fullness is at least substantially approximately equal to the corner panel fullness. Any substantial excess of edge fullness would of course result in an inoperative article of manufacture quite outside the scope of this specification and the appended claims. With two discrete corner and end elements as shown in FIGURE 3, the sides of the free edge may, as convenient or desired, be a selvedge edge, or the like, or be hemmed, enclosed in a binding tape, etc.

Where appropriate, when the elastic means are comprised essentially of corner and end elastic segments or the like, the elastic means of the invention may be inclusive of differentially tensioned elastic with the side segments thereof taking up, at most, an insubstantial amount of edge fullness, substantially all the edge fullness being taken up by the substantially evenly tensioned corner and end elastic. The elastic means of the invention may be sewn or stitched to the free edge with or without the use of a hem or binding tape. The specific means of attachment will be dictated by the requirements of those skilled in the art. Linearly extensible tensioned elastic means may be woven into the free edge and may also be adhered to the free edge by an adhesive or the like. For purposes of mass production, it is most often preferred to attach the elastic in combination with a binding tape, as shown in the above cited Roddey patent. The corner seams may be formed, as desired or convenient, with the use of a binding tape being often preferred. Other corner seams are generally satisfactory, with a flat seam, such as a French seam or the like, being especially useful since the cover will then be reversible.

Sheets of our invention may be made from any fabric woven from natural or synthetic materials. Percale and muslin woven from cotton fibers, or blends thereof with synthetic fibers, are especially satisfactory materials. Sheets according to the invention may also be made from other suitable fabric materials, including satin, velvet, and the like.

We claim:

1. A fitted cover for a mattress, or the like, substantially conforming to the top, side, and end contours thereof and comprising: an endless flap portion adapted to depend below said mattress; and endless free edge of said flap portion; corner and end segments of said free edge, each corner and end edge segment being comprised of an end of said free edge and the corners adjacent thereto; elastic means comprising substantially evenly tensioned linear corner and end elastic segments in cooperation with said corner and end edge segments, whereby said endless flap portion is self-tucking in cooperation with said elastic means; and concave corner indentations of said endless flap portion, said indentations, independently of said elastic means, being adapted to cooperate in positioning said cover upon said mattress.

2. A fitted cover for a mattress, or the like, comprising: top, side, and end panels for covering the top, sides, and ends, respectively, of a mattress; side and end flaps extending from respective associated side and end panels and adapted to underlie the bottom of a mattress; curvilinear side and end seam edges of each respective side and end panel and each respective associated side and end flap; symmetrical adjacent pairs of said side and end seam edges; each of said seam edges having a segment of concave curvature; curvilinear corner seams uniting each of said adjacent pairs, said concave segments cooperating to form concave portions of each said seam; an endless free edge of said cover; corner and end segments of said free edge, each corner and end segment being comprised of an end of said free edge and the corners adjacent thereto; and elastic means comprising substantially evenly tensioned linear corner and end elastic segments in cooperation with said corner and end segments of said free edge, whereby said cover will be self-tucking.

3. A fitted cover according to claim 2, wherein said curvilinear corner seams are each comprised of a segment of substantially sigmoid curvature.

4. A fitted cover according to claim 2, further defined in that there may be drawn upon the panel and associated flap common to each of said seam edges an extended tangent line, said tangent line being tangent to a portion of the concave segment of the respective seam edge while transecting each of said free edge and a straight line which may be drawn between the panel and associated flap common to the respective seam edge without intermediate intersection by said tangent line of the seam edge between said free edge and said straight line, a portion of the respective flap being in part bounded by the respective seam edge and said tangent line.

5. The cover of claim 4 wherein said extended tangent line is substantially perpendicular to said straight line.

6. The cover of claim 4 wherein a segment of said concave segment is substantially coincident with a segment of said tangent line.

7. The cover of claim 6 wherein said substantially coincident segments mutually transect said free edge.

8. A fitted cover for a mattress, or the like, said cover comprising: top, side, and end panels for covering the top, sides, and ends, respectively, of said mattress; side and end flaps extending from respective associated side and end panels, said flaps being adapted to underlie the bottom of said mattress; side and end seam edges of each respective side and end panel and each respective associated side and end flap; adjacent pairs of said side and end seam edges; corner seams uniting each of said adjacent pairs; an endless flap portion, and an endless free edge thereof, formed by the union of each of said adjacent pairs; corner and end segments of said free edge; each corner and end edge segment being comprised of an end of said free edge and the corners adjacent thereto; elastic means comprised

essentially of substantially evenly tensioned linear corner and end elastic segments in combination with said corner and end edge segments; edge fullness of said free edge; and corner and end gathers of said edge fullness when said corner and end edge segments, in combination with said elastic means, are relaxed upon said mattress in fitting said cover thereover, said corner and end gathers containing substantially all said edge fullness, and the fullness available to said corner and end edge segments being at least equal to that available to the respective corners and ends of the united side and end panels.

9. A fitted cover for a mattress, or the like, said cover comprising: top, side, and end panels for covering the top, sides, and ends, respectively, of said mattress; side and end flaps extending from respective associated side and end panels, said flaps being adapted to underlie the bottom of said mattress; side and end seam edges of each respective side and end panel and each respective associated side and end flap; adjacent pairs of said side and end-seam edges; corner seams uniting each of said adjacent pairs; an endless flap portion, and an endless free edge thereof, formed by the union of each of said adjacent pairs; corner and end segments of said free edge, each corner and end edge segment being comprised of an end of said free edge and the corners adjacent thereto; elastic means comprising substantially evenly tensioned linear corner and end elastic segments in combination with said corner and end edge segments; edge fullness of said free edge; and gathers of said edge fullness when said corner and end edge segments, in combination with said elastic means, are relaxed upon said mattress in fitting said cover thereover, the fullness available to said corner and end edge segments, upon full extension of said elastic segments in combination therewith, at least being: (1) greater than that available to the respective corners and ends of said endless flap portion, and (2) not substantially less than that available to the respective corners and ends of the united side and end panels.

10. A fitted sheet for a mattress, or the like, said sheet comprising: top, side, and end panels for covering the top, sides, and ends, respectively, of said mattress; side and end flaps extending from respective associated side and end panels, said flaps being adapted to underlie the bottom of said mattress; side and end seam edges of each respective side and end panel and each respective associated side and end flap; four adjacent pairs of said side and end seam edges; four corner seams, each of said corner seams uniting one of said adjacent pairs of said seam edges; an endless flap portion, and an endless free edge thereof, formed by the union of each of said adjacent pairs of seam edges; four corner segments of said free edge; tensioned linear elastic means in combination with said free edge, said elastic means consisting solely of an even number, not in excess of four, of discrete separated linear tensioned elastic elements, each said discrete elastic element being attached to at least one and not more than two of said four corner segments of said free edge; side segments of said free edge, each of said side segments between the corners adjacent thereto being uncombined with said elastic means; edge fullness of said corner segments; and corner gathers of said edge fullness when said corner segments, in combination with said tensioned discrete elastic elements, are relaxed upon said mattress in fitting said cover thereover, the fullness available to each of said four corner edge segments, upon full extension of the respective discrete elastic element in combination therewith, at least being: (1) greater than that available to the respective corner of said endless flap portion, and (2) approximately substantially equal to

that available to the respective corner of said side and end panel united by said corner seam.

11. A fitted sheet according to claim **10**, wherein said elastic means consist of two discrete linear tensioned corner and end elastic elements in combination with respective corner and end segments of said free edge, each corner and end segment being comprised of an end of said free edge and the corners adjacent thereto.

12. A fitted sheet according to claim **10**, wherein said corner seams are each comprised of a curvilinear segment of substantially sigmoid curvature.

13. A fitted sheet for a mattress, or the like, said sheet comprising: top, side, and end panels for covering the top, sides, and ends, respectively, of said mattress; side and end flaps extending from respective associated side and end panels, said flaps being adapted to underlie the bottom of said mattress; side and end seam edges of each respective side and end panel and each respective associated side and end flap; four adjacent pairs of said side and end seam edges; four corner seams, each of said corner seams uniting one of said adjacent pairs of seam edges; and endless flap portion, and an endless free edge thereof, formed by the union of each of said adjacent pairs of seam edges; four corner segments of said free edge; tensioned linear elastic means in combination with said free edge and each of said four corner segments thereof, said tensioned linear elastic means consisting solely of a small even number of tensioned linear discrete separated elastic elements, each said discrete elastic element being attached to at least one of said four corner segments of said free edge, with no more than two of said four corner segments being combined with any one of said discrete elastic elements, and no more than one of said discrete elastic elements being attached to any one of said four corner segments of said free edge; side segments of said free edge, each of said side segments between the corners adjacent thereto being uncombined with said elastic means; edge fullness of said corner segments; and corner gathers of said edge fullness when said corner segments, in combination with said tensioned discrete elastic elements, are relaxed upon said mattress in fitting said sheet thereover, the fullness available to each of said four corner edge segments, upon full extension of the respective discrete elastic element in combination therewith, at least being: (1) greater than that available to the respective corner of said endless flap portion, and (2) not substantially less than that available to the respective corner of said side and end panel united by said corner seam.

14. A fitted sheet according to claim **13**, wherein said elastic means consist of two discrete linear tensioned corner and end elastic elements in combination with respective corner and end edge segments of said free edge, each corner and end edge segment being comprised of an end of said free edge and the corners adjacent thereto.

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U.S. Cl. X.R.

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