The present invention concerns a flame retardant (FR) nonwoven fabric useful in household goods and particularly for mattresses. The nonwoven fabric comprises from about 6 to 25 weight % of a low melt binder, and at least one of FR rayon fiber, FR acrylic fiber, FR melamine fiber, or FR resin and optionally synthetic and/or natural fiber. From this nonwoven fabric, many household goods such as drapes, curtains, rugs, bedding and particularly mattresses may be constructed. The present invention also contemplates a mattress constructed from the nonwoven fabric comprising FR rayon fibers, FR acrylic fibers, FR resin, and non FR polyester fibers, and about 6 to about 25 weight % low melt binder. The mattress from this construction passes the California Test Bulletin 129 stringent conditions for mattresses used in public places. Preferably the nonwoven fabric has a batt weight of at least 5 oz./sq. yd. and preferably between 5 oz./sq. yd. and 20 oz./sq. yd.
FLAME-RETARDANT NONWOVENS

BACKGROUND OF THE INVENTION

[0001] 1) FIELD OF THE INVENTION

[0002] The present invention concerns a flame-retardant (FR) nonwoven fabric that can be employed in many applications, particularly in household goods such as stuffing for comforters, pillows, or furniture; backing for curtains and rugs; and especially for mattress fabrics. The nonwoven fabric comprises from about 6 to 25 weight percent of a low melt binder (a bicomponent fiber or low-melting fiber) and at least one of FR rayon fiber, FR acrylic fiber, FR melamine fiber, or FR resin; and optionally non-binding, non FR synthetic fiber and/or natural fiber. Nonwoven fabric prepared from these components, possessing a batt weight of greater than about 5 oz./sq. yd. is capable of passing stringent flame-retardant tests.

[0003] 2) Prior Art

[0004] Flame-retardant or flame-resistant materials (FR) are well known to those skilled in the textile art. Such materials can be woven or nonwoven, knitted, or laminates with other materials such that they pass various textile flame resistant or flame retardant tests such as California TB 117 & TB 133 for upholstery; NFPA 701 for curtains and drapes; and California Test Bulletin 129 dated October, 1992 concerning flammability tests procedure for mattresses for use in public buildings. This last test is the most stringent test for household goods known in the world.

[0005] Various FR fibers are well known to those skilled in the art. FR fibers based on polyester, rayon, melamine, nylon, acrylic and polyolefin fibers such as polyethylene, or polypropylene fibers, are known and commercially available.

[0006] U.S. Pat. No. 6,214,658 issued to Kent et al. on Apr. 10, 2001 describes fabrics made from melamine fibers that may or may not be flame resistant fabrics. This reference describes a process for dyeing melamine fabrics including blends of melamine and natural fibers (such as wool or cotton) or other synthetic fibers such as rayon or polyester. As a passing comment it mentions that the melamine fiber may be FR.

[0007] U.S. Pat. No. 6,297,178 issued to Berber et al. on Oct. 2, 2001 discloses flameproof fabrics based on FR melamine fibers and FR rayon fibers. The melamine and rayon fibers are made FR by coating the fiber with aluminum.

[0008] In spite of the above-mentioned patents and numerous other nonwoven FR fabrics, there is still a need in the industry to create inexpensive nonwoven FR articles that pass the stringent guidelines for the California Technical Bulletin 129 testing as well as other tests for upholstery, curtains and drapes. Moreover, there is a need in the industry to produce such a nonwoven article from materials that are relatively inexpensive, and have light batt weights.

[0009] Generally, the California Technical Bulletin 129 test for mattresses states that the mattress must char, but not burn through for a minimum of three minutes based on certain conditions such as the position of the flame, the temperature of the flame, the source of fuel being used, etc. Furthermore, after one hour (57 minutes after the flame source has been extinguished) of burning the test is terminated and certain conditions must be met, as more fully set forth herein.

SUMMARY OF THE INVENTION

[0010] The present invention relates to nonwoven fabric which is capable of passing the California Technical Bulletin 129 test when the nonwoven article is employed in a mattress, as well as other tests employed for other household goods like draperies.

[0011] The nonwoven fabric/article of the present invention may be produced from a combination of FR synthetic fibers and/or from all natural fibers. In each case, the nonwoven article is bonded together by means of a low melt binder. The low melt binder may be bicomponent fiber or low melting fiber. Additionally, the nonwoven article has at least one of FR rayon fibers, FR acrylic fibers, FR melamine fibers, or FR resin.

[0012] In the broadest sense, the present invention relates to a nonwoven article produced from about 6 to about 25 weight percent low melt binder; at least one of FR rayon fiber, FR acrylic fiber, FR melamine fiber, or FR resin; and optionally non-binding, non FR synthetic fiber and/or natural fibers.

[0013] In the broadest sense, the present invention also comprises a nonwoven article produced from a low melt binder, at least 2 FR fibers of the group of FR rayon, FR acrylic, or FR melamine, and optionally a non-binding synthetic fiber.

[0014] In the broadest sense, the present invention also concerns a nonwoven article produced from about 6 to about 25 weight percent low melt binder, at least 2 FR materials selected from the class of FR rayon fibers, FR acrylic, FR melamine fiber, or FR resin; and a non binding synthetic fiber.

[0015] In the broadest sense, the present invention also concerns a nonwoven article produced from synthetic fiber, natural fibers and FR resin, and about 6 to about 25 weight percent of a low melt binder.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] The nonwoven article of the present invention is produced from materials generally known to those skilled in the art, however, before the present invention those materials have not been assembled into a nonwoven article like that of the present invention.

[0017] Suitable FR fibers are those that can pass the various tests set forth below; FR fibers having too little flame resistance are not suitable for the present invention.

[0018] The FR fibers employed in the nonwoven articles of the present invention are FR rayon, FR melamine, and FR acrylic. More specifically, suitable FR rayon is sold under the registered trademark “Visi” by Säteri Oy and distributed by Ventex Incorporated. Visi is permanently fire-resistant because of the high silica content incorporated into the fiber during the manufacturing process. It does not melt or flow when in contact with heat or flame. The silica forms an insulating barrier to the source of heat.
Suitable FR melamine fibers are well known in the art and can be purchased, for example, under the trade name "BASOFIL" by McKinnon-Land-Moran LLC. Like the FR rayon, the FR melamine fiber does not melt or shrink away from the flame, but forms a char that helps control the burn and shield the materials surrounded by fabric.

Suitable FR acrylic fiber is well known to those skilled in the art and sold under the trade name of Modacrylic® distributed by Mitsubishi Textile Corporation and another suitable fiber may also be sold under the trade name CEF Plus by Solutia & Inc.

The FR resin employed is a type that has no binding characteristics. It is simply a resin which has an FR component therein, such as phosphorus, a phosphorus compound, red phosphorus, esters of phosphorus, and phosphorus complexes. The FR resin may be based on any material provided that it is compatible with the other components mentioned herein for the nonwoven batt. Typically, the FR resin is clear or translucent latex (where color is important, or any color and not translucent where color is unimportant) and is applied by spraying. A suitable commercially available FR resin is known by the trade name GUARDEX FR made by GLOTEX Chemicals in Spartanburg, S.C. There are several different GUARDEX FR resins and those skilled in the art can pick and choose among them to find that which is most compatible, taking into account such things as cost, appearance, smell, and the effect it may have on the other fibers in the nonwoven batt (does it make the other fibers rough, or have a soft hand or discolor the other fibers). The FR resin may be applied to the nonwoven batt in a range from about 6 to about 25 weight percent of the nonwoven batt. It is also within the scope of the invention to apply the FR resin to just a portion of the fibers before such fibers are employed in the nonwoven batt. For example, the FR resin could be applied to the natural fibers, before they are dry laid/air laid onto a conveyor belt. Nevertheless, when considering the nonwoven batt as a whole, the amount of the FR resin remains within the range of 6 to 25 wt. % of the nonwoven batt.

The GUARDEX FR products are generally cured at about 300 degrees Fahrenheit, or preferably lower to minimize yellowing. Although this product must be cured it has no significant binding effect on the other fibers in the nonwoven batt. It is merely cured to the fibers themselves so that it provides an FR characteristic to the fibers in addition to any FR characteristics or lack thereof of the fibers that are in the nonwoven batt.

While the above FR product (Guardex) is a liquid product applied as a spray, other FR resin in solid form may be applied as a hot melt product to the fibers, or as a solid powder which is then melted into the fibers.

The FR fibers come in different deniers from approximately 1.5 to about 10 dpf (denier per filament).

The low melt binder may be either a bicomponent fiber, for example, or a low melt polymer fiber. The low melt binder is generally employed in a range of about 5 to about 50 weight percent of the nonwoven batt. The bicomponent fiber generally contains a low melt portion and a high melt portion. Consequently, the bicomponent fiber may be either the side-by-side type where the low melt component is adjacent to high melt component, or the sheath-core type wherein the high melt component is the core and the low melt component forms the sheath. Such bicomponent fibers are well known to those skilled in the art and may be based upon polyolefin/polyester, copolyester/polyester, polyester/polyester, polyolefin/polyolefin, wherein the naming convention is the low melt component followed by the high melt component. In those types wherein it is polyester/polyester, or polyolefin/polyolefin, the high melt component has at least 5 and preferably 8 degrees Fahrenheit higher melt temperature than the low melt temperature. More specifically, for example, a polyolefin/polyolefin could be polyethylene/polypropylene. Suitable bicomponent fibers are preferably a 50/50 low melt portion to high melt portion. But the present invention also contemplates a broader range of 20/80 to 80/20 for the bicomponent fiber.

Where the low melt binder is a low melt polymer fiber, those fibers mentioned above with respect to the low melt component of the bicomponent fiber are also suitable low melt polymer fibers. In other words, the low melt polymer fiber may be copolyester, or polyolefin, such as polyethylene. Lastly, the low melt binder may also be latex sprayed onto the nonwoven batt. In this situation, the latex employed has a low melt temperature so that once the latex is sprayed on to the nonwoven fiber batt, it can be cured by means of heat (subjecting the nonwoven batt to an oven for a short period of time sufficient to cure the latex). Such low melt binders are well known to those skilled in the art.

It is within the scope of the present invention to provide a low melt binder in the form of latex. Such products are well known and commercially available. It is also known to make an FR resin in the form of latex. Those skilled in the art recognize that it may be desirable to combine low melt binder latex with FR resin latex and apply such a product to the nonwoven batt by spraying.

Suitable non FR synthetic fibers can be polyester such as polyethylene terephthalate (PET), rayon, nylon, polyolefin such as polyethylene fibers, acrylic, melamine and combinations of these. Other synthetic fibers not mentioned may also be employed. When non FR synthetic fibers are employed, they give the batt certain characteristics like loft, resilience (springiness), tensile strength, and thermal retention, useful for household goods. Preferred are PET and rayon fibers.

Natural fibers may also be employed in the nonwoven batts of the present invention. Natural fibers such as flax, kenaf, hemp, cotton and wool may be employed, depending on the properties desired. Preferred are flax and kenaf.

Because the synthetic fibers and natural fibers are non-binding and are not flame resistant, such fibers can be used to dial-in desired characteristics and cost. As such it is also within the scope of the present invention to employ a mixture of synthetic and natural fibers.

Currently there are no regulations in effect for mattresses for home (residential) use. However, California is considering drafting some regulations and many industry experts say such proposed regulations will mirror TB 129. The strictest flame resistant test for mattresses is the state of California, Department of Consumer Affairs, Bureau of Home Furnishings and Thermal Insulation, Technical Bulletin 129. The purpose of this test is to set a standard for the
behavior of mattresses used in public occupancy such as hotels, motels, dormitories, prisons, etc. Specifically, this test measures the mattress when it is subjected to a specific flaming ignition source under well-ventilated conditions. Under such conditions, it should char but not support flame for at least 3 minutes. The California burn test 129 specifies a fabric wrapped around foam with a horizontal flame at 1800 degrees Fahrenheit for 3 minutes. There can be no drips, and the fabric must contain the foam although the foam may be melted or partially melted. The fabric cannot let the flame reach and ignite the foam.

[0032] The nonwoven batt may be constructed as follows. The various combinations of fibers that can be employed in the present invention may be weighed and then dry laid/air laid onto a moving conveyor belt, for example. The size or thickness of a nonwoven batt is generally measured in terms of ounces per square yard. The speed of the conveyor belt, for example, can determine or provide the desired batt weight. If a thick batt is required, then the conveyor belt moves slower than for a thin batt. The weight % of the total fibers in the batt is 100%. This doesn’t include the weight of the FR resin since it is not in fiber form. It does, however, include the bicomponent fibers.

[0033] Suitable nonwoven fabrics of the present invention have a batt weight greater than about 5 oz./sq. yd. Preferably the batt weight ranges from 5 oz./sq. yd. to 20 oz./sq. yd. with the most preferred range being 6-9 oz./sq. yd. Using a batt weight greater than about 20 oz./sq. yd. offers no significant improvement in performance and is more costly. If desired any rearrangement of the fibers such as by carding occurs next. Then the conveyor belt moves to an area where any spray-on material is added to the nonwoven batt, for example, the FR resin sprayed onto the nonwoven batt as a latex while the batt is still positioned on the conveyor belt. If the conveyor belt is foraminous, the excessive latex FR resin drips through the belt and may be collected for reuse later. Once all the sprayed-on materials have been applied, if any, the conveyor belt can then move the nonwoven dry laid batt to an oven for melting and curing the low melt component of the bicomponent fiber or the low melt polyester fiber. The residence time in the oven depends on the fibers employed and is easily determinable by one skilled in the art. Thereafter, the nonwoven batt is cooled so that any low melt binder material re-solidifies thus locking the fibers employed into a solid batt. Thereafter, the batt may be cut to any size desired to serve as mattress fabric or other purposes such as stuffing for comforters, pillows, and furniture.

General Procedures

[0034] Various fiber components, some FR fibers and some synthetic fibers (primarily employed for increasing physical properties of the nonwoven batt) are set forth in the various examples having a range of dpf between 1.5-10 as mentioned previously. Also, the weight of the fiber batt as well as the burn test according to California’s Technical Bulletin 129, measured in seconds is set forth in the examples.

[0035] More specifically, for Example 3 the specimen consisted of a twin size, innerspring mattress and foundation set. The specimen was covered with a white/off-white colored ticking material. The construction of the mattress is well described in TB 129.

[0036] The test specimen, after conditioning to 73° and 50% R.H. was placed on a steel frame, on a load cell platform along the far side of the test room. The specified propane burner was placed centrally and parallel to the bottom horizontal surface of the mattress 1 inch from the vertical side panel of the mattress. The computer data acquisition system was started, then the burner was ignited and allowed to burn for 180 seconds. The test was continued until either all combustion ceased, or one hour passed.

[0037] The specimen does not meet the test requirements if any of the following criteria are exceeded:

[0038] 1. Weight loss of 3 lbs or greater in the first 10 minutes.

[0039] 2. Maximum rate of heat release of 100 KW.


EXAMPLE 1

[0041] Various combinations of FR fibers with other synthetic or natural fibers such as rayon, PET, flax and kenaf were produced. The various fibers were dry laid onto a moving conveyor belt as is known in the art. For Samples 1-6 and 11, where an FR resin was employed, it was sprayed on to the nonwoven fiber batt. The nonwoven fiber batt was transported via the conveyor belt to an oven such that the low melt component melts. Then the fibers were transported to a cooling area where the low melt component of the low melt binder re-solidified thus locking the various fibers into a unitary structure as a batt. These various nonwoven batts, at various weights, were then subjected to a burn time test similar to the California Technical Bulletin 129. In the test the nonwoven fabric was wrapped once around the foam. A flame was applied directly to the nonwoven fabric for at least 300 secs. and the structural integrity was noted. All of the test samples maintained their structural integrity for at least the time indicated, and the flame did not reach the foam. The burn time is listed in seconds. The batt weight is listed in ounces per square yard.

[0042] In all samples where FR resin was employed (Samples 1-6 and 11), GURDEX FR resin was used. The FR resin, because it is sprayed on, is based on the total weight of the fibers that are employed to make up the nonwoven batt. In all samples, a bicomponent fiber comprising a low melt sheath component of copolyester and a high melt component of PET was employed. In Samples 2, 4, and 9 the FR acrylic employed was 7 dpf (denier per filament). In Sample 7 the dpf of the FR acrylic was 5, and in Samples 3, 5, and 10 the dpf was 2. The dpf of the FR rayon in Samples 4 and 9 was 3.5. In Sample 8 it was 5 dpf, and in Samples 5 and 10 it was 8 dpf. The nonwoven batt construction and results are set forth below in Table 1.
TABLE 1

<table>
<thead>
<tr>
<th>Sample</th>
<th>FR Rayon</th>
<th>FR Acryl</th>
<th>FR Melamine</th>
<th>Rayon</th>
<th>PET</th>
<th>FR Resin*</th>
<th>Bico</th>
<th>Batt weight (oz/yd²)</th>
<th>Burntime (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>35</td>
<td>(21)</td>
<td>15</td>
<td>8.67</td>
<td>605</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>25</td>
<td>30</td>
<td>(14)</td>
<td>8.5</td>
<td>623</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>25</td>
<td>30</td>
<td>(20)</td>
<td>8.6</td>
<td>941</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>30</td>
<td>25</td>
<td></td>
<td>(15)</td>
<td>8.9</td>
<td>**1200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td>25</td>
<td></td>
<td>(14)</td>
<td>8</td>
<td>**1200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>80</td>
<td>20</td>
<td></td>
<td>(24)</td>
<td>9.5</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>40</td>
<td>40</td>
<td></td>
<td>15</td>
<td>5.1</td>
<td>451</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>40</td>
<td></td>
<td>15</td>
<td>8</td>
<td>**360</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>30</td>
<td>25</td>
<td></td>
<td>15</td>
<td>8.9</td>
<td>**360</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>30</td>
<td>25</td>
<td></td>
<td>15</td>
<td>8</td>
<td>**360</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>25% Flax, 25% Kenaf</td>
<td>35</td>
<td></td>
<td>15</td>
<td>11.7</td>
<td>1200</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Weight % based on weight of all other components.
**The burn time was terminated because it had more than passed the test. In all other instances the burn time test was permitted to go to completion (i.e., where the flame burned through the nonwoven material such that it could no longer contain the liquefied foam).
***The weight % is based on the weight of the natural fibers only.

EXAMPLE 2

Example 2 was a repeat of Samples 1, 5, 6, & 8-10 and their corresponding burn time test, except in Samples 1 and 5 the amount of bicomponent employed was 20% by weight, while the amount of PET employed was 5 weight percent. In each instance, the burn time was stopped at 600 seconds. 600 seconds is more than 3 times longer than what is required by California Technical Bulletin 129. The results are set forth in Table 2 below.

TABLE 2

<table>
<thead>
<tr>
<th>Sample</th>
<th>FR Rayon</th>
<th>FR Acryl</th>
<th>FR Melamine</th>
<th>Rayon</th>
<th>PET</th>
<th>FR Resin*</th>
<th>Bico</th>
<th>Batt weight (oz/yd²)</th>
<th>Burntime (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>15</td>
<td>(21)</td>
<td>20</td>
<td>8.67</td>
<td>**600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td>15</td>
<td>(14)</td>
<td>20</td>
<td>8</td>
<td>**600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>80</td>
<td>20</td>
<td></td>
<td>(24)</td>
<td>9.5</td>
<td>**600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>15</td>
<td></td>
<td>15</td>
<td>8.9</td>
<td>**600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>30</td>
<td>25</td>
<td></td>
<td>15</td>
<td>8</td>
<td>**600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>30</td>
<td>25</td>
<td></td>
<td>15</td>
<td>8</td>
<td>**600</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

While this result is consistent for samples 1 and 6, the retest of sample 8 gave a slightly stronger result.

EXAMPLE 3

A nonwoven batt similar to Sample 5 was made, except 20% by weight FR resin was sprayed onto the batt (instead of 14% by weight, as in Sample 5). The batt weight was 5.8 oz./sq. yd. (instead of 8 oz./sq. yd., as in Sample 5). A twin size mattress was constructed as described in the General Procedures and more specifically in TB 129. This mattress was subjected to the full Flammability Test Procedure for Mattresses for Use in Public Buildings specified in the General Procedures and more specifically in TB 129. The test results are reported below.

The ambient temperature was 75°F with a relative humidity of 50%. After the test, the specimen was removed from the test room and was damaged in the following manner:

- Ticking Material: 40% consumed.
- Internal Components: 50% consumed.

<table>
<thead>
<tr>
<th>Time (Min:Sec)</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0:00</td>
<td>The test was started.</td>
</tr>
<tr>
<td>0:05</td>
<td>The ticking material began to char.</td>
</tr>
<tr>
<td>0:08</td>
<td>The ticking material ignited.</td>
</tr>
<tr>
<td>0:45</td>
<td>The flames began to propagate across the top panel.</td>
</tr>
<tr>
<td>3:00</td>
<td>The propane test burner was turned off.</td>
</tr>
<tr>
<td>3:30</td>
<td>The flames began to propagate across the front side of foundation.</td>
</tr>
<tr>
<td>8:30</td>
<td>Flaming drops began to fall from the left hand of the mattress.</td>
</tr>
<tr>
<td>10:10</td>
<td>Flaming drops ceased from the left hand.</td>
</tr>
<tr>
<td>14:50</td>
<td>Flaming drops began to fall from the right hand.</td>
</tr>
<tr>
<td>23:15</td>
<td>The flames reached the left front corner of the mattress.</td>
</tr>
<tr>
<td>45:42</td>
<td>The flames began to decrease on the left corner of the mattress.</td>
</tr>
<tr>
<td>50:00</td>
<td>The flames reached the right front corner of the mattress.</td>
</tr>
<tr>
<td>53:49</td>
<td>The flames reached the right rear corner of the mattress.</td>
</tr>
<tr>
<td>57:30</td>
<td>Flaming drops began to fall from the left rear corner of the mattress.</td>
</tr>
<tr>
<td>60:00</td>
<td>Test terminated/specimen extinguished.</td>
</tr>
</tbody>
</table>
A weight loss of 3 pounds or more in the first 10 minutes is a test failure. For this Example, the result of 0.5 pounds is excellent. A test failure also occurs if the maximum rate of heat released exceeds 100 KW. For this Example, the result of 40.60 KW is excellent. A test failure occurs if the total heat release is 25 MJ or more in the first 10 minutes. For this Example the result was 8.60 MJ. This was excellent.

Thus, it is apparent that there has been provided, in accordance with the invention, a nonwoven fabric that fully satisfies the objects, aims, and advantages set forth above. While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications, and variations as fall within the spirit and broad scope of the invention.

What is claimed is:

1) A nonwoven article produced from about 6 to about 25 weight % FR melt binder; at least one of FR rayon fiber, FR acrylic fiber, FR melamine fiber, or FR resin; and optionally nonbonding synthetic or natural fiber, wherein said nonwoven article has a weight of at least 5 oz./sq. yd.

2) The nonwoven article of claim 1, wherein said nonbonding synthetic fiber is rayon, polyester, or a mixture thereof.

3) The nonwoven article of claim 1, wherein article is produced from at least two of FR rayon fiber, FR acrylic fiber, FR melamine fiber, or FR resin.

4) The nonwoven article of claim 1, wherein said low melt binder is a bicomponent fiber or a low melting fiber.

5) The nonwoven article of claim 4, wherein said bicomponent fiber has a polyester component, and a polyolefin or copolyester component.

6) The nonwoven article of claim 4, wherein said low melting fiber is copolyester or polyolefin fiber.

7) The nonwoven article of claim 1, wherein said FR resin is a phosphorus compound, red phosphorus, or phosphorus compatible with said nonbonding synthetic fiber.

8) The nonwoven article of claim 1, having about 50 weight % rayon, about 35 weight % polyester, and about 15 weight % bicomponent fiber, totaling 100 weight %, and about 21 weight % FR resin, based on said 100 weight %.

9) The nonwoven article of claim 1, having about 30 weight % FR acrylic, about 25 weight % FR melamine, about 30 weight % rayon, and about 15 weight % bicomponent fiber, totaling 100 weight %, and about 14 weight % FR resin, based on said 100 weight %.

10) The nonwoven article of claim 1, having about 30 weight % FR acrylic, about 25 weight % FR melamine, about 30 weight % rayon, and about 15 weight % bicomponent fiber, totaling 100 weight %, and about 20 weight % FR resin, based on said 100 weight %.

11) The nonwoven article of claim 1, having about 30 weight % FR acrylic, about 25 weight % FR melamine, about 30 weight % FR rayon, and about 15 weight % bicomponent fiber, totaling 100 weight %, and about 15 weight % FR resin, based on said 100 weight %.

12) The nonwoven article of claim 1, having about 30 weight % FR acrylic, about 25 weight % polyester, about 30 weight % FR rayon, and about 15 weight % bicomponent fiber, totaling 100 weight %, and about 14 weight % FR resin, based on said 100 weight %.

13) The nonwoven article of claim 1, having about 80 weight % rayon, about 20 weight % bicomponent fiber, totaling 100 weight %, and about 24 weight % FR resin based on said 100 weight %.

14) The nonwoven article of claim 1, having about 40 weight % FR acrylic, about 40 weight % FR melamine, and about 20 weight % bicomponent fiber, totaling 100 weight %.

15) The nonwoven article of claim 1, having about 40 weight % FR rayon, about 45 weight % polyester, and about 15 weight % bicomponent fiber, totaling 100 weight %.

16) The nonwoven article of claim 1, having about 30 weight % FR acrylic, about 25 weight % FR melamine, about 30 weight % FR rayon, and about 15 weight % bicomponent fiber, totaling 100 weight %.

17) The nonwoven article of claim 1, having about 30 weight % FR acrylic, about 30 weight % FR rayon, and about 15 weight % bicomponent fiber, totaling 100 weight %.

18) The nonwoven article of claim 1, wherein said natural fiber is flax or kenaf.

19) A nonwoven article produced from: about 6 to about 25 weight % low melt binder; at least two of FR rayon fiber, FR acrylic fiber, FR melamine fiber, or FR resin; and optionally a nonbonding synthetic fiber, wherein said nonwoven article has a weight of at least 5 oz./sq. yd.

20) A nonwoven article produced from: about 6 to about 25 weight % low melt binder; at least two of FR rayon fiber, FR acrylic fiber, FR melamine fiber, or FR resin; and optionally a nonbonding synthetic fiber, wherein said nonwoven article has a weight of at least 5 oz./sq. yd.

21) A nonwoven article produced from synthetic fiber, natural fibers and about 6 to about 25 weight % low melt binder, and an FR resin, wherein said nonwoven article has a weight of at least 5 oz./sq. yd.

22) The nonwoven article of claim 21, wherein said synthetic fiber is rayon, polyester, or a mixture thereof.

23) The nonwoven article of claim 21, wherein said synthetic fiber is from about 15 weight % to about 55 weight % of said article.

24) The nonwoven article of claim 21, wherein said natural fiber is flax, kenaf, or a mixture of these.

25) The nonwoven article of claim 21, wherein said natural fiber is from about 40 weight % to about 60 weight % of said article.

26) The nonwoven article of claim 21, wherein said low melt binder is a bicomponent fiber or a low melting fiber.

27) The nonwoven article of claim 26, wherein said bicomponent fiber has a polyester component, and a polyolefin or copolyester component.

28) The nonwoven article of claim 26, wherein said low melting fiber is copolyester or polyolefin fiber.

29) A mattress, said mattress having a nonwoven batt comprising about 6 to about 25 weight % low melt binder, and at least one of FR rayon fiber, FR acrylic fiber, FR melamine fiber, or FR resin, wherein said nonwoven batt has a weight of at least 5 oz./sq. yd.

30) The mattress of claim 29, wherein said mattress has FR rayon fibers, FR acrylic fibers, FR resin, and non FR polyester fibers.