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HOT MELT ADHESIVE COMPOSITIONS FOR HARD COVERED BOOKBINDING

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tion Ser. No. 692,710, Dec. 22, 1967. This application
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10 Claims

ABSTRACT OF THE DISCLOSURE

Hot melt adhesive compositions comprising a blend of
a high molecular weight, isotactic polybutylene resin, and
a tackifying resin; the resulting compositions being
especially applicable for use in a hard covered bookbind-
ing but also utilizable in a variety of packaging, laminating
and specialty hot melt applications. Hard covered books
having their pages adhesively bound by means of the
above specified hot melt compositions.

This application is a continuation-in-part of my previ-
ous application, Ser. No. 692,710, filed Dec. 22, 1967, now
abandoned.

The manufacture of hard covered books involves unique
features of construction and operation which are not re-
quired in other methods of bookbinding. Thus, in this
operation, the pages are printed either in long, continuous
sheets or in individual sheets which are cut, folded and
properly arranged to form a series of stacks, referred to
as signatures. These signatures are collected and then
enclosed by means of end papers which are typically ad-
hered to the outer leaves of the first and last signatures.
Thereafter, the signatures are transferred to sewing ma-
chines where they are sewn individually and to one an-
other. Emulsion adhesives are then applied to the sewn
signatures in a "gluing off" operation which provides
greater rigidity to the book body so as to enable it to
withstand subsequent trimming and handling operations.
The bound signatures are rounded, i.e. deformed such that
a curvature is impressed on the back edge of the book,
backed and then lined-up in a procedure which involves
the application of hot glue to the rounded surface and
the attachment of a strip of fabric, usually crash and
backing paper thereto. The books are then ready for the
final casing-in operation wherein the hard cover is attached
to the bound book.

Needless to say, the latter procedure is a tedious, time-
consuming, discontinuous operation. These inefficiencies
are particularly to be noted in the sewing operation which
is utilized to contain the pages of the book; the latter
operation requiring machine sewing of the signatures of
each individual book.

In order to overcome the difficulties inherent in these
prior art processes as well as to markedly increase the
speed of the various operations, the use of emulsion ad-
hesives and hot melt adhesives has been resorted to as a
replacement for the time-consuming sewing operation. Al-
though the use of the latter hot melt adhesives has met
with commercial success in the binding of paper-backed
books, i.e. soft covered books, wherein they have served
to increase the rate of output, to eliminate the stitching
and stapling step, and to provide more permanent bind-
ings, serious limitations have been encountered when at-
tempts have been made to use hot melts in the binding of
hard covered books. These limitations have been especially
noted in the critical rounding step of the binding opera-
tion, i.e. the step wherein a curvature is impressed on the
back edges of the book body and where the rear portions

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of the outermost signatures are bent into a flange-like
projection along each side of the back edge so that the
cover boards may be closely fitted to the assembly body
of leaves while permitting the hinge portions thereof to
have ample freedom of motion without exhibiting any
tendency to become torn or pulled out of place. Thus,
currently available hot melt adhesives either: (1) provide
adhesive films which are too rigid to be impressed into
a rounded configuration or which split in the attempt,
thereby losing their film continuity and enabling the pages
to separate from the bound signatures; or, (2) they pro-
vide adhesive films which, although forming the desired
rounded configuration, exhibit an excessive plastic flow.
In the latter instance, the excellent "elastic memory" ex-
hibited by these films causes them to abandon the required
rounded configuration and to revert to the configuration
which they assumed prior to the rounding operation.
Therefore, since the critical rounded configuration is not
provided in either instance, it becomes obvious that the
currently available hot melt adhesives are not readily
applicable for use in the binding of rounded, hard covered
books but, instead, must be limited for use in the prepa-
ration of the undesirable square-backed, hard covered
books.

Additional difficulties have also been noted as a result
of the previously described gluing off operation. Thus, this
procedure requires a time consuming drying operation
before the book body may be further processed. Further-
more, the emulsion adhesives which are typically utilized
in this procedure exhibit the tendency to penetrate the
individual pages to an excessive degree such that the area
of the adhesive bond between the pages may often extend
as far as the printed material.

It is, thus, the prime object of this invention to provide
an adhesive composition which exhibits excellent adhesive
strength and a high degree of permanent set, thereby
enabling it to be effectively utilized in the binding of hard
covered books. It is a further object to provide a process
for the binding of hard covered books which will reduce
the complicated and time consuming details heretofore
present therein. It is still a further object that the adhesive
be deposited by means of applicator equipment conven-
tional in the bookbinding industry. Still another object
is to provide an adhesive which may be handled in bulk
form for use in the premelting equipment presently avail-
able in the industry; or, which may be pelletized, diced
or granulated for convenient premelting in an applicator
of the extruder type; or, which may be utilized in rope
or cord form for applicators designed to handle adhesives
in the latter physical forms. Various other objects and
advantages of this invention will become apparent to the
practitioner from the following detailed description there-
of.

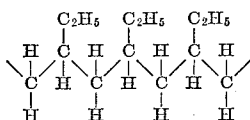
I have now discovered that by utilizing hot melt adhe-
sive compositions, as hereinafter described, in the bind-
ing of hard covered books, it is possible to overcome
substantially all of the difficulties previously encountered
in the binding of this type of book. Thus, the novel hot
melt adhesives of this invention exhibit the rubbery char-
acteristics and adhesive strength which are essential to
bind the individual book pages. Furthermore, these hot
melt adhesive products display good heat stability, rapid
setting speed, and excellent adhesion to a variety of cellu-
losic and noncellulosic materials such, for example, as
all paper stocks, waxed-glassine sheets, metallic foils,
polyester sheets, etc. Of particular importance is the fact
that these novel hot melts exhibit a high degree of perma-
nent set. Thus, their adhesive films which serve to bind
the books are capable of being deformed to correspond
to the desired rounded configuration of the back of the
book and, due to poor elastic memory, of permanently
retaining this rounded configuration. It is the combina-

tion of these essential properties in the novel hot melts of this invention that now permits the manufacture of quality, permanently bound, rounded, hard covered books at high production speeds.

Furthermore, even where it is desirable to utilize sewn signatures in the bookbinding operation, these novel hot melts may be satisfactorily utilized as "gluing off" adhesives inasmuch as they provide for rapid production speeds, for proper penetration of the individual pages and for the desired rounding of the sewn signatures.

As previously noted, the novel hot melt adhesive compositions of this invention comprise a blend of: (1) a high molecular weight, isotactic polybutylene resin, which represents the basic component of the system; and (2) at least one tackifying resin which serves to extend the adhesive properties of the system.

Until recently, the only synthetic polymers that could be prepared lacked controlled regular arrangement. With the advent of stereospecific polymerization techniques, however, the relationship of the monomer units to one another in the polymeric structure can now be precisely regulated. Thus, the polybutylene which is a basic component of the adhesives of this invention is a product of such a stereospecific polymerization procedure and is referred to as an "isotactic" or "stereospecific" polymer in that the repeating units of its polymeric chain all possess the same stereochemical configuration along the chain. This is to be contrasted with "atactic" polymers wherein the repeating units of the polymeric chain vary in a random configuration along the chain. The stereochemical nature of the isotactic polybutylene required for use in my novel adhesives may be readily observed from the following structural depiction thereof:



The high molecular weight, isotactic polybutylenes utilized in the novel compositions of this invention are prepared by the stereospecific polymerization of monomeric butene-1. Methods for conducting such polymerization procedures are well known to those skilled in the art; typical procedures being disclosed in U.S. Patent 3,197,452, issued July 27, 1965, and in Dutch application No. 6507546, published Dec. 16, 1965. These procedures generally involve the use of polymerization initiators or catalysts for the polymerization of the monomeric butene-1 to polymers of high molecular weight. Among the preferable catalytic systems utilized in such procedures are the reaction products of metal alkyl compounds, such as aluminum triethyl, and a heavy metal compound, such as the trihalides of Groups IV-VI metals in the Periodic Table, e.g. titanium, vanadium, chromium, zirconium, molybdenum and tungsten, etc. The formation of polymers exhibiting substantial isotactic properties as well as the variations in the molecular weight thereof will thus depend on the nature of the polymerization catalyst, the nature of the co-reactants in the system and the reaction conditions being utilized, etc.

The applicable isotactic polybutylenes are relatively rigid while in their plastic form but flow readily upon being heated. As noted, they must exhibit a high molecular weight. Thus, expressing molecular weight in terms of "melt flow," the applicable isotactic polybutylenes to be used in my novel adhesives should exhibit a melt flow in the range of from about 0.2 to 300, and preferably from 0.4 to 40.0. The latter melt flow values are determined by the method described in ASTM D 1236-62 T and are inversely related to molecular weight, i.e. the lower the melt flow value, the higher the molecular

weight. In addition, it should be noted that minor amounts, i.e. up to about 5% by weight, of alpha-olefin comonomers, such as ethylene and propylene, may be present in the butene-1 polymerization system without any substantial loss of the herein-described desirable properties displayed by the resultant essentially homopolymeric system.

The tackifying resins which are present in my novel systems serve to extend the adhesive properties of the isotactic polybutylene. As contemplated in my invention, the term "tackifying resin" includes: (1) hydrogenated wood rosin; (2) polyterpene resins having a softening point, as determined by ASTM method E 28-58 T, of from about 10-150° C.; the latter polyterpene resins generally resulting from the polymerization of terpene hydrocarbons in the presence of Friedel-Crafts catalysts at moderately low temperatures; examples of commercially available resins of this type being the Nirez resins sold by the Tenneco Chemical Corp. and the Piccolyte S-10, S-25, S-40, S-85, S-100, S-115, S-125 and S-135 resins as sold by the Pennsylvania Industrial Chemical Corp.; (3) aliphatic petroleum hydrocarbon resins having a Ball and Ring softening point of from about 80-125° C., the latter resins resulting from polymerization of monomers consisting primarily of 5 carbon atoms olefins and diolefins; examples of commercially available resins of this type being Wing-Tack 95 as sold by the Goodyear Tire and Rubber Co. and the Sta-Tac resins sold by the Reichhold Chemical Corp.; and (4) atactic polypropylene having a Ball and Ring softening point of from about 120-160° C.

As a desirable optional ingredient, wax diluents may be employed in my novel systems in order to reduce the melt viscosity or cohesive characteristics of the hot melt adhesive compositions without appreciably decreasing its adhesive binding characteristics. Among the applicable wax diluents are included: (1) low molecular weight, liquid polybutylene in the range of from about 600 to 3000; (2) petroleum waxes such as paraffin wax having a melting point of from about 130-165° F. and microcrystalline wax having a melting point of from about 140-200° F.; the latter melting points being determined by ASTM method D 127-60; (3) polyethylene greases having a softening point of from about 80-100° C. and a hardness value, as determined by ASTM method D-1321, of from about 60-120; (4) hydrogenated animal, fish and vegetable fats and oils such as hydrogenated tallow, lard, soya oil, cottonseed oil, castor oil, menhaden oil and cod liver oil, etc.; (5) mineral oil; and, (6) synthetic waxes made by polymerizing carbon monoxide and hydrogen, such as Fischer-Tropsch wax.

The procedure for preparing my novel hot melt adhesive compositions involves placing the tackifying resin, or mixtures thereof, in a jacketed mixing kettle (or in a jacketed heavy duty mixer of the Baker-Perkins or Day type for compositions having high viscosities) equipped with a stirrer and thereupon raising the temperature to a range of from about 250 to 400° F., and preferably 300 to 350° F.; the precise temperature utilized depending on the melting point of the particular tackifying resin. When the resin has melted, stirring is initiated and the isotactic polybutylene is then added together with any optional additives whose presence may be desired; the addition of the latter components being extended over a prolonged period in order to avoid the formation of lumps. Stirring and heating are continued until a smooth, homogeneous mass is obtained whereupon the wax diluent, if present, is thoroughly admixed therewith. The resulting hot melt adhesive composition is drawn off and may be used immediately in hot pots; or, it may be molten-extruded into rope form or converted into pellets, rods, cylinders, slugs, or billets depending on the equipment which will be subsequently used to apply the hot melt; or, it may be placed in cooling pans and held in bulk form for later use; or, it may be granulated or diced.

With regard to proportions, the novel hot melt adhesive compositions of this invention typically contain a concentration of isotactic polybutylene ranging from about 20 to 80% and a concentration of tackifying resin also ranging from about 20 to 80%; the latter concentrations being based on the total weight of the hot melt composition. Where wax diluents are employed in these hot melt systems, they are usually present in a concentration of from about 5 to 50%, as based on the total weight of the hot melt composition. In the latter instance, the minimum concentration of tackifying resin may decrease to 10%, by weight.

Other optional additives may be incorporated into the hot melt compositions of this invention in order to modify certain properties thereof. Among these additives may be included: antioxidants such as hindered phenols and thio compounds; colorants such as titanium dioxide; and, fillers such as talc and clay, etc. It should also be noted that minor quantities of polyethylene and isotactic polypropylene may be added in order to alter the flexibility characteristics of the adhesive films cast from my novel hot melt compositions.

The hot melts of this invention are typically applied at a temperature of from about 300 to 400° F., a corresponding melt viscosity of from about 5000 to 40,000 centipoises, and at a wet film thickness of from about 5 to 30 mils when utilized in the hard cover book binding operation of this invention. As previously noted, the basic technique for binding rounded, hard covered books, as conceived by the novel process of this invention, comprises the steps of: (1) printing, cutting, folding and arranging the signatures; (2) cutting the signatures to remove the signature folds and to expose a fully squared backbone; (3) roughing the backbone so as to expose the fibers at the back edge and make them more receptive to the hot melt composition; (4) applying the hot melt composition by means of any conventional equipment in the industry, preferably in a manner such that the adhesive penetrates edgewise into each leaf of the backbone and simultaneously provides a continuous film or coating over the entire back surface of the sheets; (5) allowing the adhesive to solidify at ambient temperatures or by means of a force cooling operation; (6) rounding and backing the bound leaves, i.e. mechanically deforming the backbone, and concurrently the front face, to the shape commonly employed in the manufacture of hard covered books; the latter operation being completed without splitting the adhesive film or disarranging the sequence of leaves; (7) lining-up the bound sheets, i.e. applying crash or like fabric to a freshly applied adhesive coating which may or may not be identical to the previously utilized hot melt composition; (8) enclosing the bound sheets in endpapers or interlining, if such endpapers have not previously been bound into the book body; and, (9) casing-in the bound book. As an alternative step, the crash or like material may be applied to the partially solidified hot melt at a point between steps (4) and (5) as contrasted with its more conventional application at step (7); the use of the latter sequence being dependent on the particular book binding equipment that is being utilized. In either instance, this novel procedure results in the preparation of rugged, durable, hard covered books which are substantially free from such difficulties as loss of their rounded configuration and separation of their bound pages.

Although great emphasis has been placed, in this disclosure, on the use of my novel hot melt compositions in the binding of hard covered books, it should be noted that these novel adhesives may also be effectively utilized in a variety of packaging, laminating and carton sealing operations. Furthermore, they may be effectively utilized in the binding of soft covered books such as pocket books, magazines, catalogs and brochures, etc.

The following examples will further illustrate the embodiment of this invention. In these examples all parts given are by weight unless otherwise noted.

EXAMPLE I

This example illustrates the preparation of a hot melt adhesive composition typical of the novel products of this invention.

A kettle which had been heated to 300° F. and which was equipped with a stirring paddle was charged with 50 parts of an aliphatic petroleum hydrocarbon resin having a Ball and Ring softening point of 95° C.; the latter resin being commercially available under the trademark "Wing-Tack 95" sold by Goodyear Tire and Rubber Co. This resin was completely melted. Stirring was then initiated and 30 parts of isotactic polybutylene having a melt flow of 20.0 were added slowly in order to prevent the formation of lumps. Heating and stirring were continued until a clear, homogeneous mass was obtained whereupon 20 parts of mineral oil were admixed therewith in order to reduce the melt viscosity of the system.

The resulting homogeneous hot melt composition had a viscosity of 7750 centipoises (cps.) at 350° F., as determined by a Brookfield Viscometer using a #6 spindle at 20 r.p.m., and a Ball and Ring softening point of 210° F. Upon coating the above prepared molten hot melt composition onto a variety of paper stocks, excellent tack and adhesive qualities were noted in each instance.

In order to demonstrate the high degree of permanent set exhibited by the above prepared hot melt and thereby its applicability for bookbinding procedures wherein rounding is a critical feature, the molten hot melt was subjected to a test procedure whereby it was cast, by means of a heated Bird applicator, onto a polytetrafluoroethylene-coated steel sheet yielding a film having a dry film thickness of 20 mils. After cooling, the film specimen was stripped from the plate and cut into a ½ x 2 inch test specimen. The specimen was then elongated to approximately 500% of its original length and, after the stress was relaxed, allowed to reach equilibrium for a period of 24 hours. The specimen was then measured in order to determine the extent to which it had reverted to its original length.

The polybutylene hot melt prepared in this example exhibited only a 25% recovery. This value is to be contrasted with the 95% recovery exhibited by a polyvinyl acetate-based hot melt and the 80% recovery exhibited by an ethylene-vinyl acetate-based hot melt; the latter two varieties of hot melts being representative of the commercial compositions which have been used in bookbinding operations. Thus, it is evident that the novel hot melt compositions of this invention are capable of maintaining a rounded configuration and are, therefore, well-suited for use in the binding of hard covered books.

EXAMPLE II

This example illustrates the preparation of a number of the novel hot melts of this invention utilizing a variety of different isotactic polybutylenes, tackifying resins and wax diluents.

The general procedure set forth in Example I, hereinabove, was utilized in preparing each of the following formulations. The melt viscosity of each composition was determined on a Brookfield Viscometer using a #6 spindle at 20 r.p.m. Tensile Strength was determined on films cast from the hot melts according to Test Method A of procedure ASTM D882-56 T utilizing an Instron Tensile Tester; the latter films being prepared according to the method set forth in the "Percent Recovery" test in Example I. "Percent Recovery" of similar films was determined according to the test procedure specified in Example I.

7 Composition A

	Parts
Isotactic polybutylene—melt flow of 20.0	30
Hydrogenated wood rosin	35
Atactic polypropylene—Ball and Ring softening point of 120–130° C.	25
Paraffin wax—melting point of 150° F.	10

The viscosity, at 350° F., of the resulting hot melt was 8250 cps. Films derived therefrom exhibited a tensile strength of 400 p.s.i. and a 27.5% recovery. This composition was thus particularly well-suited for use in the binding of rounded, hard covered books.

Composition B

Composition A was modified by replacing the paraffin wax with 10 parts of a microcrystalline wax having a melting point of 180° F. The viscosity, at 350° F., of the resulting hot melt was 9125 cps. This composition also exhibited a slightly slower rate of solidification, thereby being especially applicable for use in commercial binding equipment which function at a slower operating speed.

Composition C

	Parts
Isotactic polybutylene—melt flow of 1.0	40
Hydrogenated wood rosin	25
Atactic polypropylene—Ball and Ring softening point of 120–130° C.	25
Hydrogenated tallow oil	10

A heavy duty mixer was utilized to prepare the above described composition due to the rather low melt flow of the isotactic polybutylene.

The viscosity, at 350° F., of the resulting hot melt was 10,750 cps. Films derived therefrom exhibited a tensile strength of 705 p.s.i. thereby indicating the increased toughness which is obtained when extremely high molecular weight isotactic polybutylenes are present in the novel hot melts of this invention. In addition, this composition was found to be applicable for use in the binding of paperbacked, i.e. soft covered, books.

Composition D

	Parts
Isotactic polybutylene—melt flow of 20.0	30
Aliphatic petroleum hydrocarbon resin—Ball and Ring softening point of 95° C. (Wing-Tack 95 sold by Goodyear Tire and Rubber Co.)	35
Atactic polypropylene—Ball and Ring softening point of 120–130° C.	25
Paraffin wax—melting point of 150° F.	10

The viscosity, at 350° F., of the resulting hot melt was 14,625 cps. Films derived therefrom exhibited a tensile strength of 523 p.s.i. This hot melt composition proved to be well-suited for use in the binding of rounded, hard covered books.

Composition E

	Parts
Isotactic polybutylene—melt flow of 20.0	40
Aliphatic petroleum hydrocarbon resin—Ball and Ring softening point of 95° C. (Wing-Tack 95 sold by Goodyear Rubber and Tire Co.)	35
Paraffin wax—melting point of 150° F.	10
Polybutylene having a low molecular weight of 1000	15

The viscosity, at 350° F., of the resulting hot melt was 18,500 cps. Films derived therefrom exhibited a tensile strength of 610 p.s.i. and a 34% recovery. In addition, this hot melt exhibited outstanding adhesion as evidenced by the difficulty encountered in removing its cast film from the polytetrafluoroethylene-coated sheet.

8 Composition F

	Parts
Isotactic polybutylene—melt flow of 20.0	40
Terpene resin—ASTM softening point of 10° C.—derived from beta-pinene and sold under the trademark "Piccolyte S-10" by Pennsylvania Industrial Chemical Corp.	40
Paraffin wax—melting point of 165° C.	20

The viscosity, at 350° F., of the resulting hot melt was 7000 cps. Excellent "paper tearing" adhesive bonds were derived from this particular hot melt composition, thereby indicating its suitability for use in paper to paper laminating techniques.

Composition G

	Parts
Isotactic polybutylene—melt flow of 1.0	20
Atactic polypropylene—Ball and Ring softening point of 120–130° C.	50
Polyterpene resin—ASTM softening point of 115° C. (sold under the trademark "Nirez 115" by Tenneco Chemical Corp.)	30

The viscosity, at 350° F., of the resulting hot melt was 5625 cps. Inasmuch as the above prepared product exhibited a relatively low viscosity and good color, it also proved to be suitable for clean machining in a high speed carton sealing operation.

Composition H

	Parts
Isotactic polybutylene—melt flow of 20.0	60
Atactic polypropylene—Ball and Ring softening point of 120–130° C.	40

A heavy duty mixer was utilized to prepare the above described hot melt composition.

The viscosity, at 350° F., of the resulting hot melt was 40,000 cps. Films derived therefrom exhibited a tensile strength of 1000 p.s.i. The combination of high viscosity and tensile strength made this tough rubbery product suitable for use in the binding of difficult-to-adhere paper stock which is frequently used in better quality books.

Summarizing, it is thus seen that this invention provides for the preparation of novel hot melt adhesive compositions which are especially well suited for use in the binding of rounded, hard covered books.

Variations may be made in proportions, procedures and materials without departing from the scope of this invention which is defined by the following claims.

I claim:

1. A hot melt adhesive composition comprising a blend of: (1) an essentially homopolymeric isotactic polybutylene resin having a melt flow value of from about 0.2 to 300; (2) at least one tackifying resin selected from the group consisting of hydrogenated wood rosin, polyterpene resins having an ASTM softening point of from about 10 to 150° C., aliphatic petroleum hydrocarbon resins having a Ball and Ring softening point of from about 80 to 125° C., and atactic polypropylene having a Ball and Ring softening point of from about 120 to 160° C.; and (3) a wax diluent selected from the group consisting of polybutylene having a molecular weight of from about 600 to 3000, petroleum waxes, polyethylene greases, hydrogenated animal fats and oils, hydrogenated vegetable fats and oils, hydrogenated fish fats and oils and Fischer-Tropsch wax.
2. The hot melt adhesive composition of claim 1, wherein the melt viscosity thereof is in the range of from about 5000 to 40,000 centipoises at a temperature of from about 300 to 400° F.
3. The hot melt adhesive composition of claim 1, wherein said wax diluent is present in a concentration of from about 5 to 50% and said tackifying resin is present in a concentration of from about 10 to 80%; the latter

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concentrations being based on the total weight of said adhesive composition.

4. A hard covered book containing a plurality of sheets therein which are bound to one another at the backbone of the book by means of the dried residue of a hot melt adhesive composition comprising a blend of: (1) an essentially homopolymeric isotactic polybutylene resin having a melt flow value of from about 0.2 to 300; and (2) at least one tackifying resin selected from the group consisting of hydrogenated wood rosin, polyterpene resins having an ASTM softening point of from about 10 to 150° C., aliphatic petroleum hydrocarbon resins having a Ball and Ring softening point of from about 80 to 125° C., and atactic polypropylene having a Ball and Ring softening point of from about 120 to 160° C.

5. The hard covered book of claim 4, wherein the backbone of said book has a rounded configuration.

6. The hard covered book of claim 4, wherein each of said isotactic polybutylene and said tackifying resin is present in said adhesive composition in a concentration of from about 20 to 80%, based on the total weight of said adhesive composition.

7. The hard covered book of claim 4, wherein the melt viscosity of said adhesive composition is in the range of from about 5000 to 40,000 centipoises at a temperature of from about 300 to 400° F.

8. The hard covered book of claim 4, wherein said adhesive composition also contains dispersed therein at least one wax diluent.

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9. The hard covered book of claim 8, wherein said wax diluent is present in said adhesive composition in a concentration of from about 5 to 50% and said tackifying resin is present in a concentration of from about 10 to 80%; the latter concentration being based on the total weight of said adhesive composition.

10. The hard covered book of claim 8, wherein said wax diluent in said adhesive composition is selected from the group consisting of polybutylene having a molecular weight of from about 600 to 3000, petroleum waxes, polyethylene greases, hydrogenated animal fats and oils, hydrogenated vegetable fats and oils, hydrogenated fish fats and oils, and Fischer-Tropsch wax.

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