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(72) Townley, Glenn C., US
(72) Cunnane, Francis J., US
(73) Asten, Inc., US

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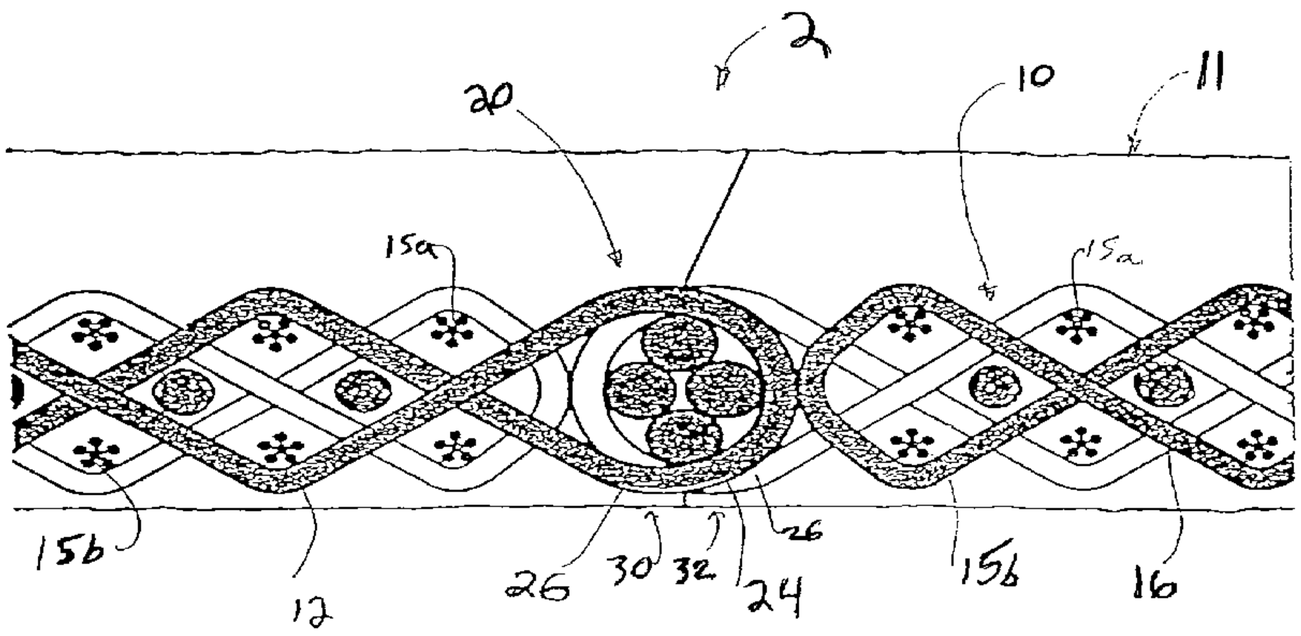
(54) **FEUTRE POUR MACHINE A PAPIER A RESILIENCE AMELIOREE ET PROCEDE DE FABRICATION**

(54) **PRESS FELT RESISTANT TO NIP REJECTION AND METHOD**



(57) Procédé de fabrication de feutre pour machine à papier, selon lequel une trame de force et un traitement de thermofixation par passes multiples sont utilisés pour stabiliser la chaîne du support textile et obtenir une meilleure résilience sous la pince. De préférence, dans le produit fini, une nappe de fibres est jointe au support textile par aiguilletage.

(57) Cross machine stuffer yarns are used in the construction of a base fabric for a papermakers wet felt. The stuffer yarns in combination with a multiple pass heat setting process stabilize the machine direction yarns of the base fabric to provide resistance to nip rejection. Preferably a fibrous batt is needled to the base fabric to finish the wet press felt.

ABSTRACT

Cross machine stuffer yarns are used in the construction of a base fabric for a papermakers wet felt. The stuffer yarns in combination with a multiple pass heat setting process stabilize the machine direction yarns of the base fabric to provide resistance to nip rejection. Preferably a fibrous batt is needled to the base fabric to finish the wet press felt.

PRESS FELT RESISTANT TO NIP REJECTION AND METHOD

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to papermakers fabrics, more particularly to a press fabric resistant to nip rejection and a method for making same.

Description of Related Art

Wet press felts are used in the press section of papermaking machines to transport and dewater an aqueous paper web which is being made into a desired paper product. The dewatering process conventionally entails transporting the aqueous web through a series of press nips. The aqueous paper web is carried on a press felt through at least one nip defined between two metal rolls which squeezes water from the paper web into the underlying press felt.

When in use, press felts are under tension to maintain uniformity in the fabric. However, this tension combined with the high pressures in traveling through the nip may not be sufficient to straighten the press felt yarns just before the press felt enters the press nip. If the press nip load is high and the felt yarns are not straight, they may exhibit a type of scissoring effect which results in a collection or bunching up of yarns at the entrance to the press nip known as nip rejection. Nip rejection is undesirable since it can damage the press felt fabric and cause undesirable marking or irregularities in the paper product itself.

Nip rejection can be combated by increasing the tension in the fabric through the nip. However, many papermaking machines

cannot physically exert the amount of tension on the fabric needed to consistently eliminate nip rejection problems. In addition, after running for a day or two, the effects of the added tension disappear since the caliper of the fabric is decreased due to maximum allowable stretching of the fabric. In addition, excessive tension of the press fabric increases the potential for "roping" or "folding over" of the fabric which can result in complete wreckage of the fabric, damage to the paper product and possible damage to the papermaking machine.

It would be desirable to provide a press felt which is resistant to nip rejection.

SUMMARY OF THE INVENTION

The present invention is directed to a wet press felt which includes a base fabric woven from synthetic yarns. After weaving, the base fabric is subjected to a special three stage heat setting process to make the fabric resistant to nip rejection. The heat setting process includes heat setting the fabric at a relatively high temperature and tension at two passes and a third pass of heat setting the synthetic base fabric at a lower temperature.

In the preferred embodiment, the base fabric is woven in a simple two layer weave structure having a system of machine direction yarns interwoven with two layers of cross machine direction yarns. Preferably an intermediate layer of monofilament cross machine direction stuffer yarns are provided in the natural voids occurring in the simple two layer weave pattern. The inclusion of the monofilament stuffer yarns in combination with the three stage heat setting process

significantly enhances the fabric's resistance to nip rejection.

It is an object of the invention to provide a wet press base fabric which is resistant to nip rejection.

It is a further object of the invention to provide a wet press felt base fabric which maintains its caliper over time.

It is yet a further object of the invention to provide a wear resistant wet press felt base fabric.

Other objects and advantages will be apparent to those skilled in the art from the following detailed description of a presently preferred embodiment.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a sectional view of a prior art press felt.

Figure 2 is a sectional view of a press felt made in accordance with the teachings of the present invention.

Figures 3a-d are sectional views of the weave pattern of the present invention showing a single MD yarn.

Figure 4 is a block diagram of a method of heat setting the press felt fabric in accordance with the teachings of the present invention.

Figure 5a is a schematic diagram illustrating a prior art fabric as it travels through a press nip.

Figure 5b is a schematic diagram illustrating the press fabric depicted in **Figure 1** as it travels through a press nip.

Figure 6a is a sectional view of a prior art press fabric deflecting as it travels through a press nip.

Figure 6b is a sectional view illustrating the press fabric depicted in **Figure 1** as it travels through a press nip with minimal deflection.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to **Figure 1** and **2** there is shown a prior art press felt **1** and a press felt **2** made in accordance with the teachings of the present invention. Both press felts **1**, **2** comprises a base fabric **10** to which batt material **11** is needled in a conventional manner.

In both felts **1**, **2**, the base fabric **10** is preferably comprised of a repeat of four monofilament machine direction (MD) yarns **12**, interwoven with an eight shed repeat system of multi-filament cross machine direction (CMD) yarns **15a,b** to define a woven fabric having two layers of multi-filament cross machine direction yarns. A seam **20** is provided which includes seaming loops **26** formed on opposing fabric ends **30** and **32**. In seaming, the loops **26** are intermeshed and maintained together by pintle members **24** thereby rendering the base fabric **10** endless in a conventional manner. One prior art press as depicted in **Figure 1** is the ASF-100™ press felt available from Asten, Inc., the assignee of the present invention.

As illustrated in **Figure 2**, the press felt made in accordance with the teachings of the present invention includes an intermediate layer of monofilament stuffer yarns **16** disposed within the natural voids defined in the prior art two layer weave pattern. Additionally, as the described in more detail below, a special three stage heat setting process is used in finishing the base fabric after weaving to reduce residual shrinkage of the synthetic yarns. The combination of the inclusion of monofilament CMD yarns in the natural voids of the prior art weave in conjunction with the three stage heat setting process

renders the press felt **2** substantially more resistant to nip rejection than the prior art press felt **1**.

Referring to **Figures 3a-3d**, there is shown in detail the complete repeat pattern for each MD yarn **12** of the four MD yarn repeat of the base fabric for the felt depicted in **Figure 2**. Preferably, the first MD yarn of the repeat weaves as shown in **Figure 3a**, the second MD in the repeat we use as shown in **Figure 3b,** the third MD yarn of the repeat weaves as shown in **Figure 3c** and the fourth MD yarn of the repeat weaves as shown in **Figure 3d**.

The CMD stuffer yarns **16** are disposed between the two layers of CMD yarns **15a** and **15b**. The CMD stuffer yarns **16** fill the void spaces between adjacent pairs of CMD filling yarns **15a** and **15b** and surrounding MD yarns **12**. The CMD stuffer yarns **16** do not rise to either the surface of the base fabric **10.** Although it is known in the art to use bulky or deformable yarns in the voids of such two layer fabrics to reduce permeability, the monofilament CMD stuffer yarns **16** of the present invention provide increased dimensional stability to the base fabric **10** by preventing movement of woven MD yarns **12**, especially when placed through a nip press.

In one example, the MD yarns are preferably woven 72 yarns per inch of .019 inch diameter nylon monofilament yarns, each layer of CMD filling yarns **15a, 15b** are preferably woven 11 yarns per inch of .008 inch/2/2 nylon cable yarn and the CMD stuffer yarns **16** are also .019 inch diameter monofilament nylon yarns. The CMD filling yarns **15a,b** can be either cabled or single monofilament. The CMD stuffer yarn can be either cabled, monofilament, monofilament plied or multifilament yarns, but

monofilament yarns are preferred and are believed to produce the greatest resistance to nip rejection. Preferably the fabric exhibits a permeability range of 15 to 110 CFM.

As shown in **Figure 4**, the press felt base fabric **10** is heat set using conventional heat setting equipment in a series of three passes first heat set pass **42**, a second heat set pass **44** and final heat set pass **46**. The first and second heat setting passes **42** and **44** are each performed while maintaining a 40 pounds per linear inch (pli) tension on the fabric with a 340°F cylinder and 350°F air box. The 40 pli tension is also maintained in the final heat setting step. However, the temperatures are then dropped on the third heat set pass **46** to 250°F. All three heat setting passes are preferably performed at a speed of 4 feet per minute for the fabric length.

Although specific temperature preferences are provided, the temperature in the first and second heat set passes preferably is within a range of 340°F to 360°F and, in the third heat setting pass, the temperature is preferably maintained in a range of 240°F to 260°F.

The three stage heat setting process is intended to reduce or eliminate any residual dimensional change characteristic in the machine direction yarns. It is believed that the heat setting process in conjunction with the use of the monofilament stuffer CMD yarns **16** combine to provide a reduced and relatively stable crimp in the machine direction yarns. Accordingly, such stabilization of the crimp in the machine direction yarns is believed to provide the resultant nip rejection resistance exhibited by the inventive press felts.

As schematically illustrated in **Figure 5a**, the conventional press fabric **1** is susceptible to buildup of fibers at the entrance **52** of the press nip defined by press rollers **50**. As shown more clearly in **Figure 6a**, the conventional press fabric **1** experiences substantial vertical deflection, represented by dashed lines **56**, due to the loads **60** resulting from the press nip. Due to the void spaces present in the prior art fabrics, a scissoring or springing action results.

Figure 5b illustrates the press felt **2** made in accordance with the teachings of the present invention passing through the press nip defined by rollers **50**. As shown more clearly in **Figure 6b**, the press felt base fabric **10** which has been previously heat set as described above, includes stuffer yarns **16** which prevent the fabric **10** from excessively compressing and causing building at the entrance **52** to the nip **50**.

While the present invention has been described in terms of the preferred embodiment, other variations which are within the scope of the invention as defined in the claims will be apparent to those skilled in the art.

* * *

We claim:

1. A wet press felt having increased nip rejection resistance for use under tension in the press section of a papermaking machine comprising:

a woven base fabric having a system of synthetic machine direction yarns interwoven with a system of cross machine direction yarns in a weave pattern which creates natural voids within the cross machine direction system; and

means for stabilizing the machine direction crimp of said synthetic machine direction yarn including:

synthetic cross machine direction stuffer yarns disposed within said natural voids of said CMD yarn system; and

said base fabric having been heat set in multiple passes at a time at least as great as the maximum tension which will be placed on the fabric in its intended use at a first temperature in an initial heat setting pass and at a second lower temperature in a subsequent heat setting pass.

2. A wet press felt according to claim 1 further comprising fibrous batt material needled onto said base fabric.

3. A wet press felt according to claim 1 wherein said base fabric is woven in a repeat pattern of four monofilament machine direction yarns interwoven with an eight shed repeat system of cross machine direction yarns arranged in two layers and monofilament stuffer yarns are disposed within the cross machine direction yarns to define an intermediate layer of cross machine direction yarns.

4. A wet press felt according to claim 3, wherein said machine direction yarns are woven 72 yarns per inch of .019 inch diameter nylon yarns.

5. A wet press felt according to claim 4, wherein each of said two layers of cross machine direction yarns are preferably 11 yarns per inch of .008 inch/2/2 nylon cable yarns and

said cross machine direction stuffer yarns are .019 inch diameter monofilament nylon yarns.

6. A wet press felt according to claim 3 wherein said base fabric, after weaving, has been heat set in three passes at a tension of approximately 40 pound per linear inch and a temperature in the first and second passes in the range of 340°F to 360°F and a temperature in the third pass in the range of 240°F to 260°F.

7. A method for increasing the resistance to nip rejection in a press felt which includes a woven base fabric having a system of synthetic machine direction yarns interwoven with a system of cross machine direction yarns in a repeat pattern wherein natural voids are defined within the cross machine direction yarn system comprising:

incorporating monofilament cross machine direction stuffer yarns in weaving the base fabric to fill the naturally occurring voids in the CMD yarn system; and

heat setting the base fabric in multiple passes under a tension at least as great as the tension under which the fabric

is to be used and at a first temperature in an initial heat setting pass and at a second lower temperature in a subsequent heat setting pass.

8. A method according to claim 7 wherein the heat setting of the base fabric includes a first heat set pass in the range of 340° to 360° degrees Fahrenheit and at 40 pli tension.

9. A method according to claim 8 wherein the heat setting of the base fabric includes a second heat set pass in the range of 340° to 360° F and at 40 pli tension.

10. A method according to claim 9 wherein the heat setting of the base fabric includes a third heat set pass in the range of 240° to 260° degrees Fahrenheit and at 40 pli tension.

11. A method according to claim 7 wherein said heat set passes are performed at a speed of about 4 feet a minute.

12. A method according to claim 7 further comprising needling batt material onto the base fabric.

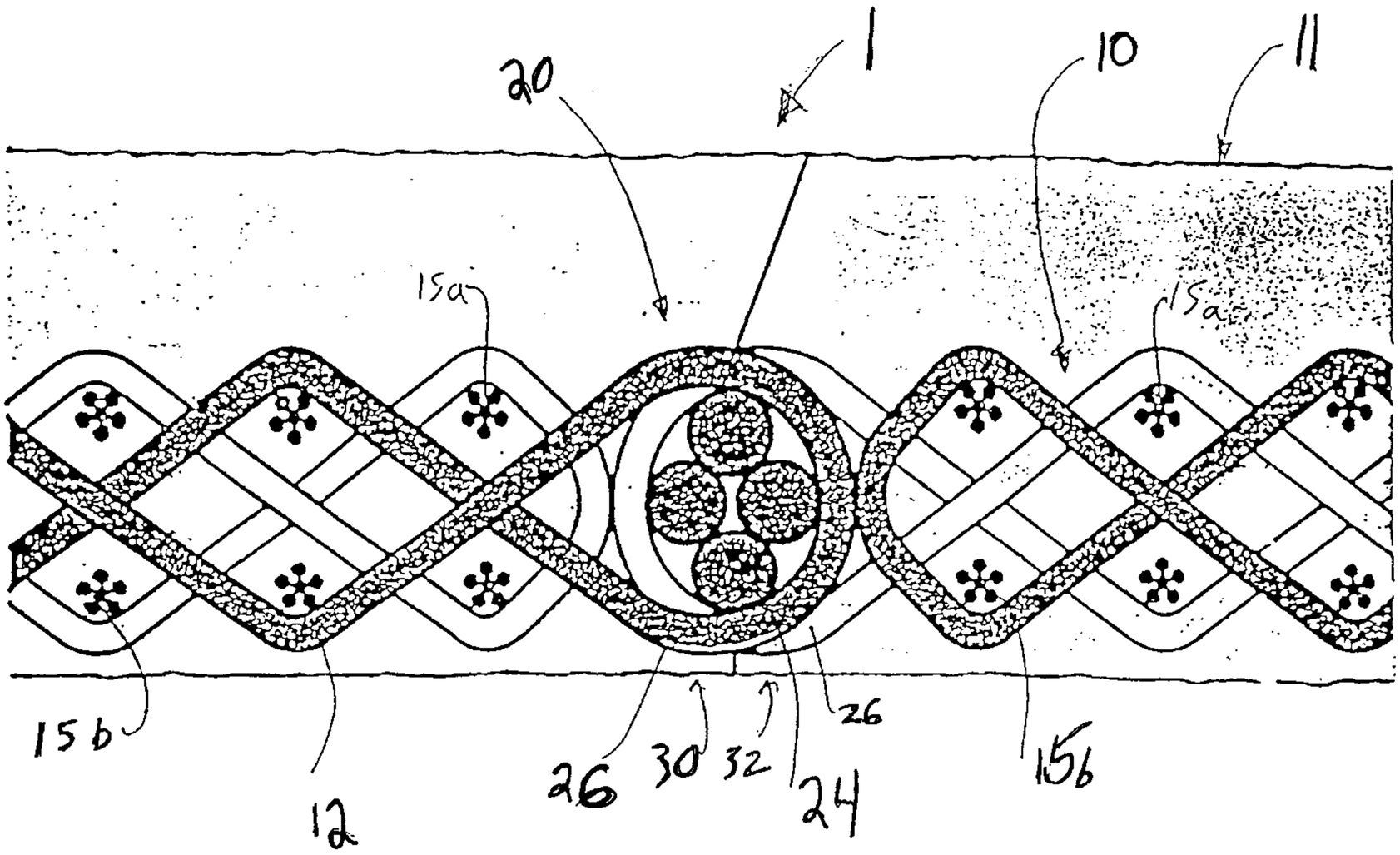


FIG. 1
(prior art)

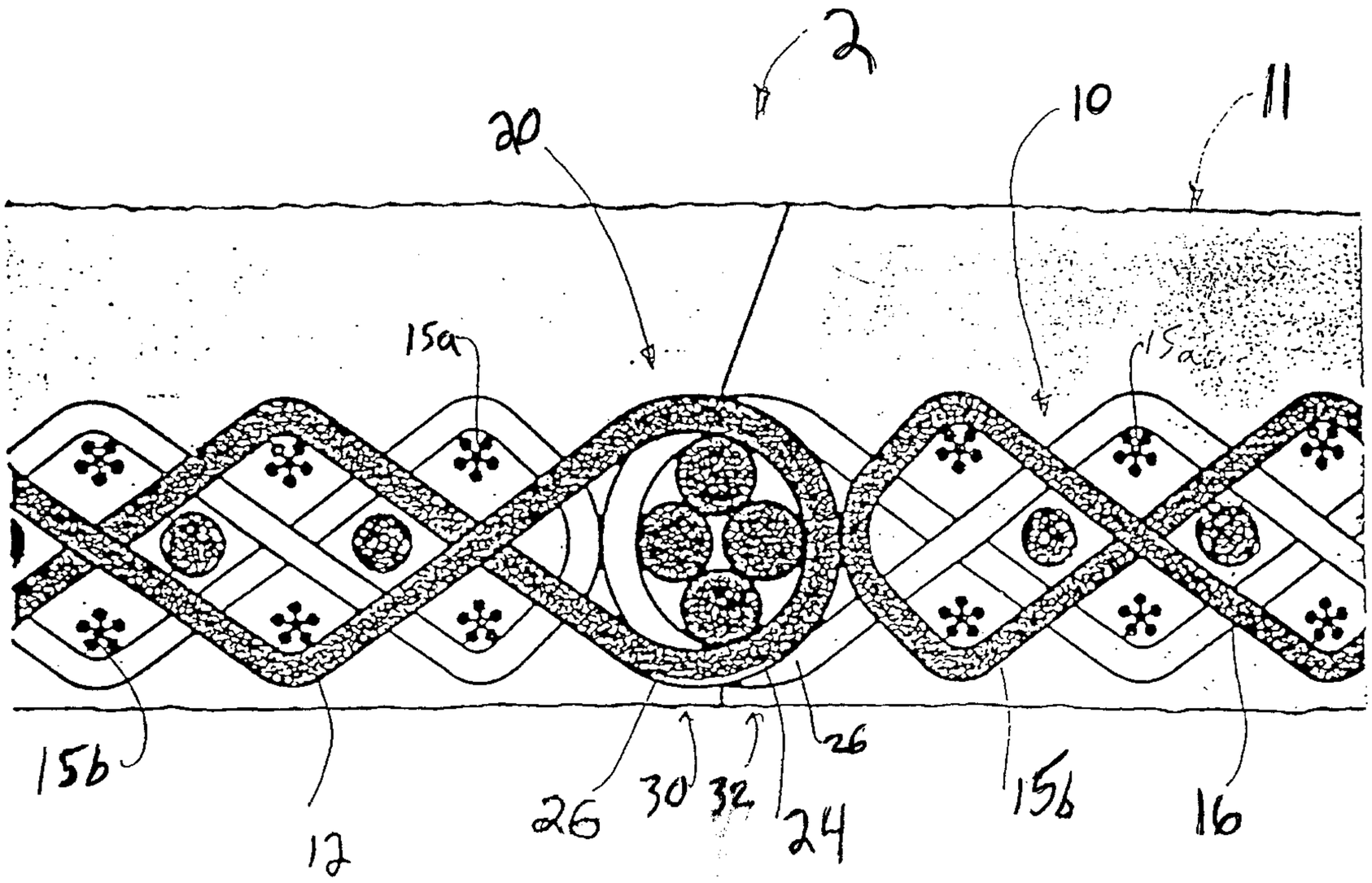


FIG. 2

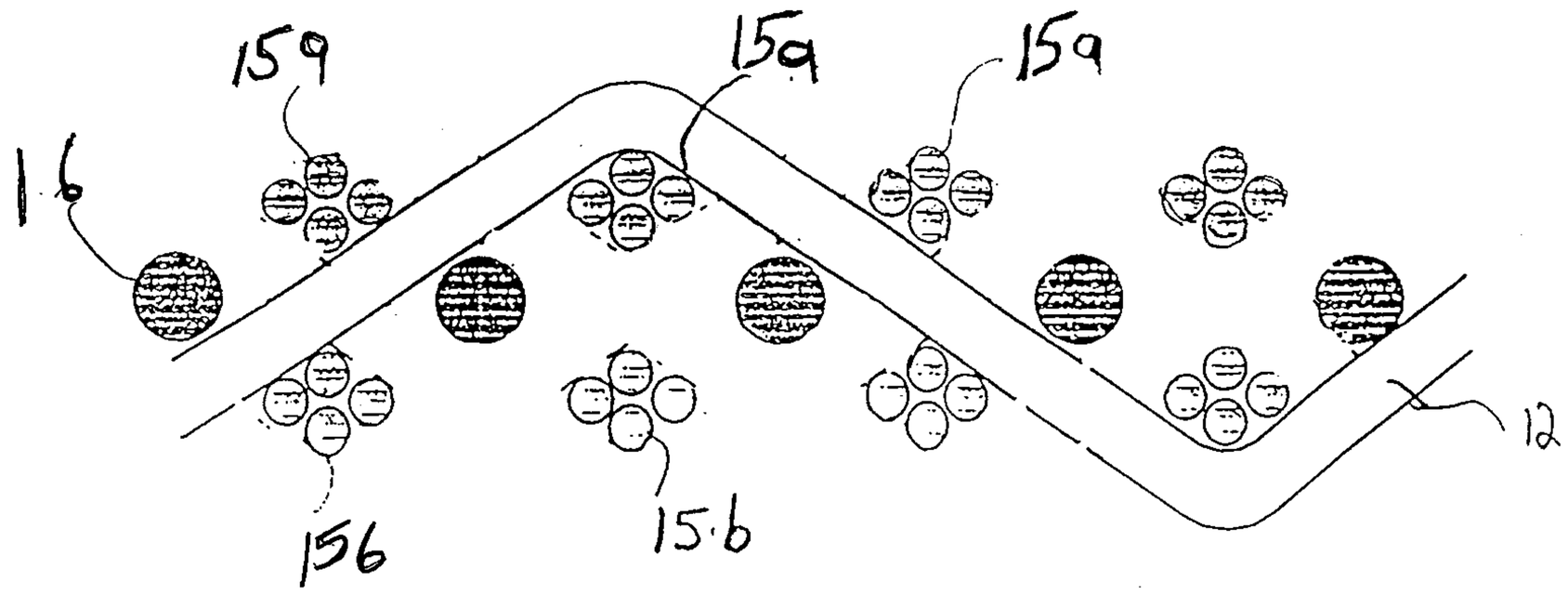


FIG. 3a

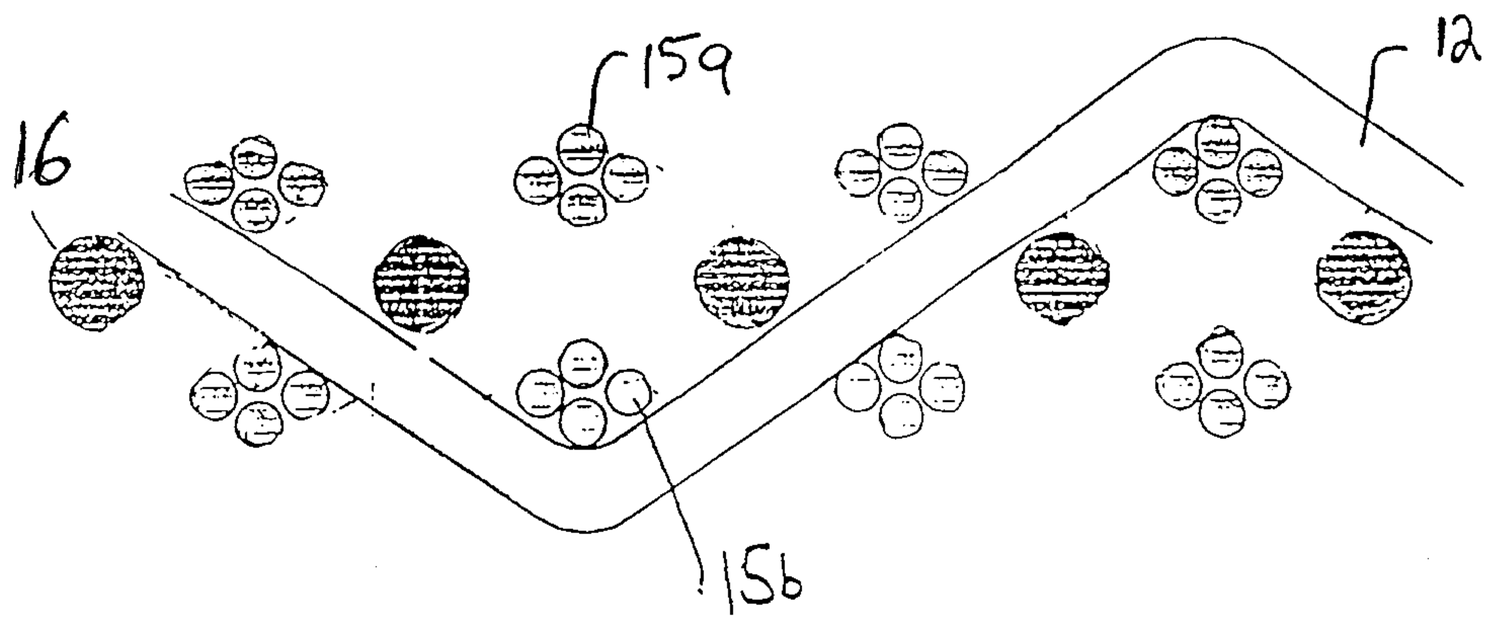


FIG. 3b

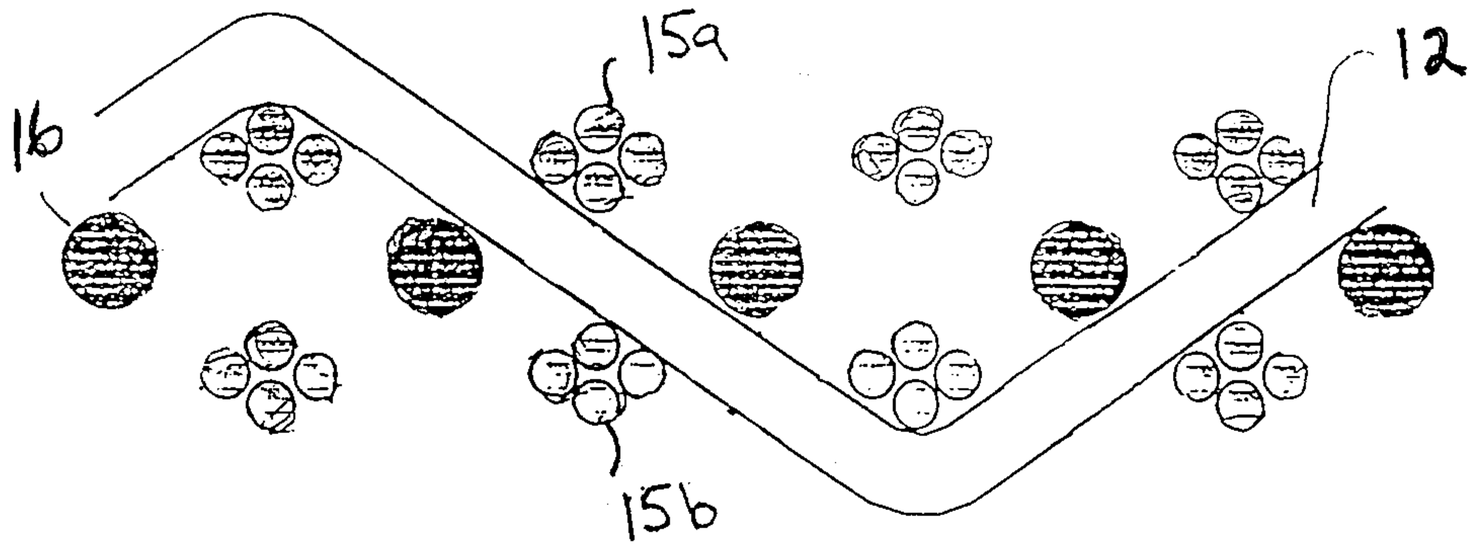


FIG. 3c

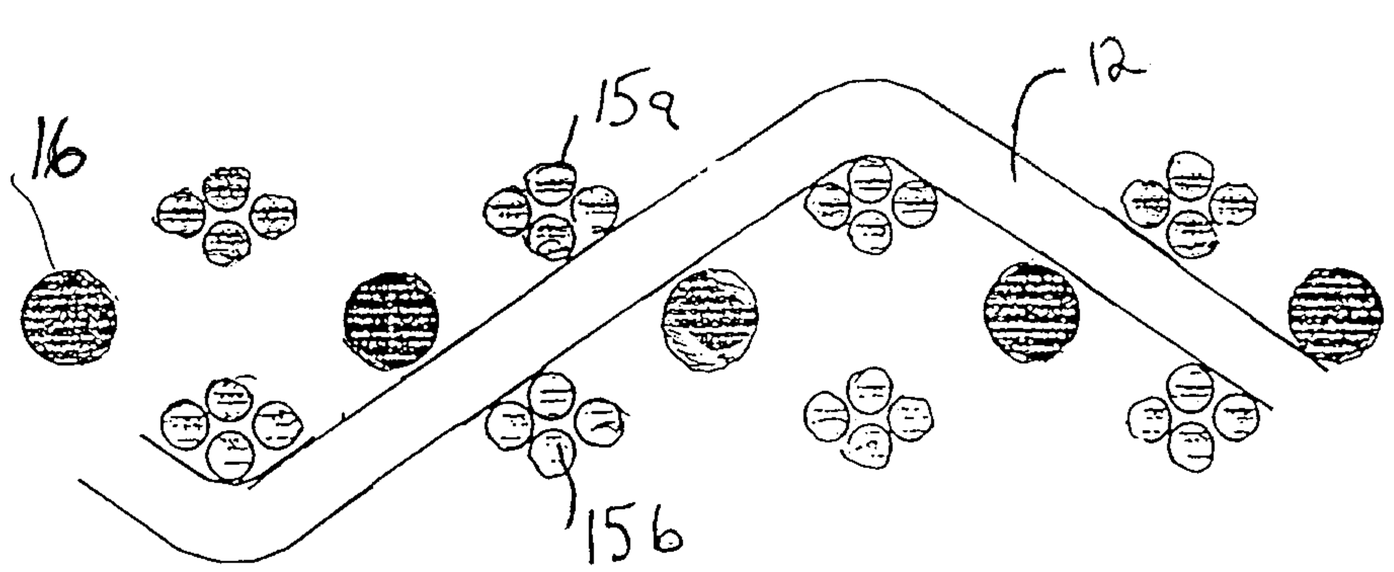
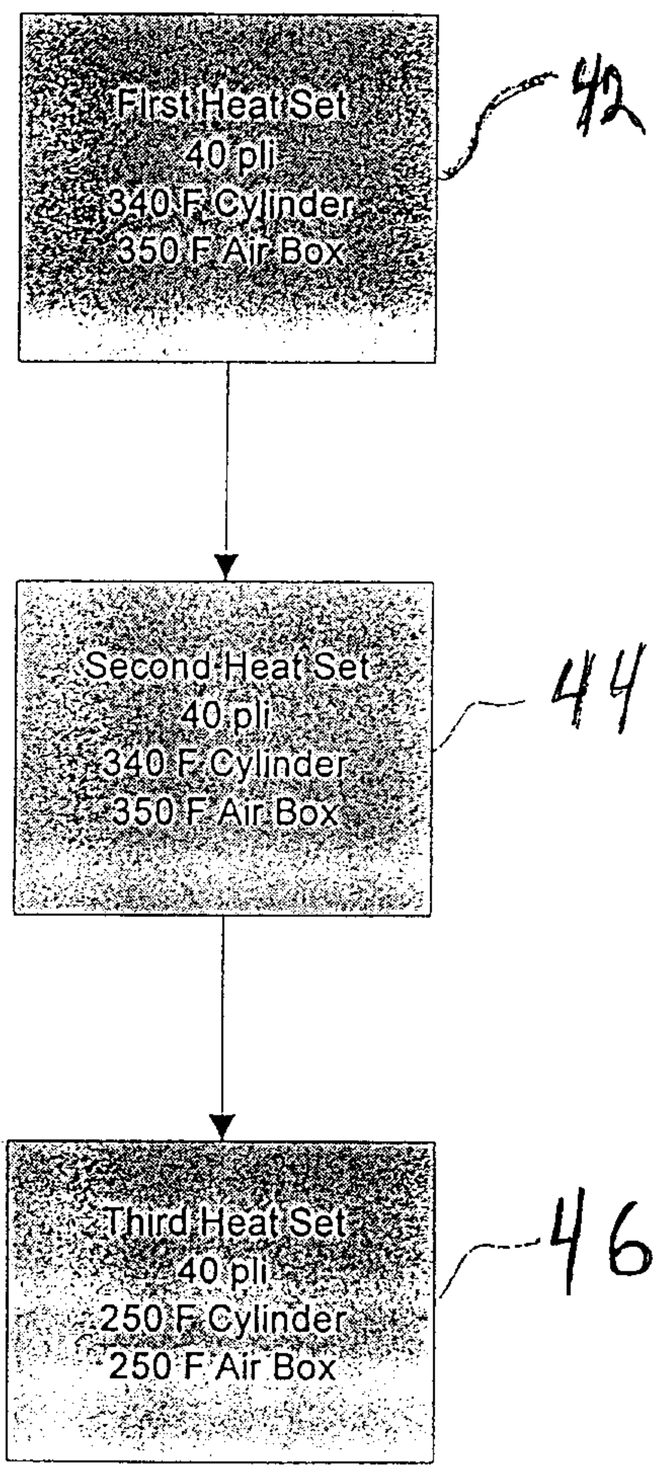
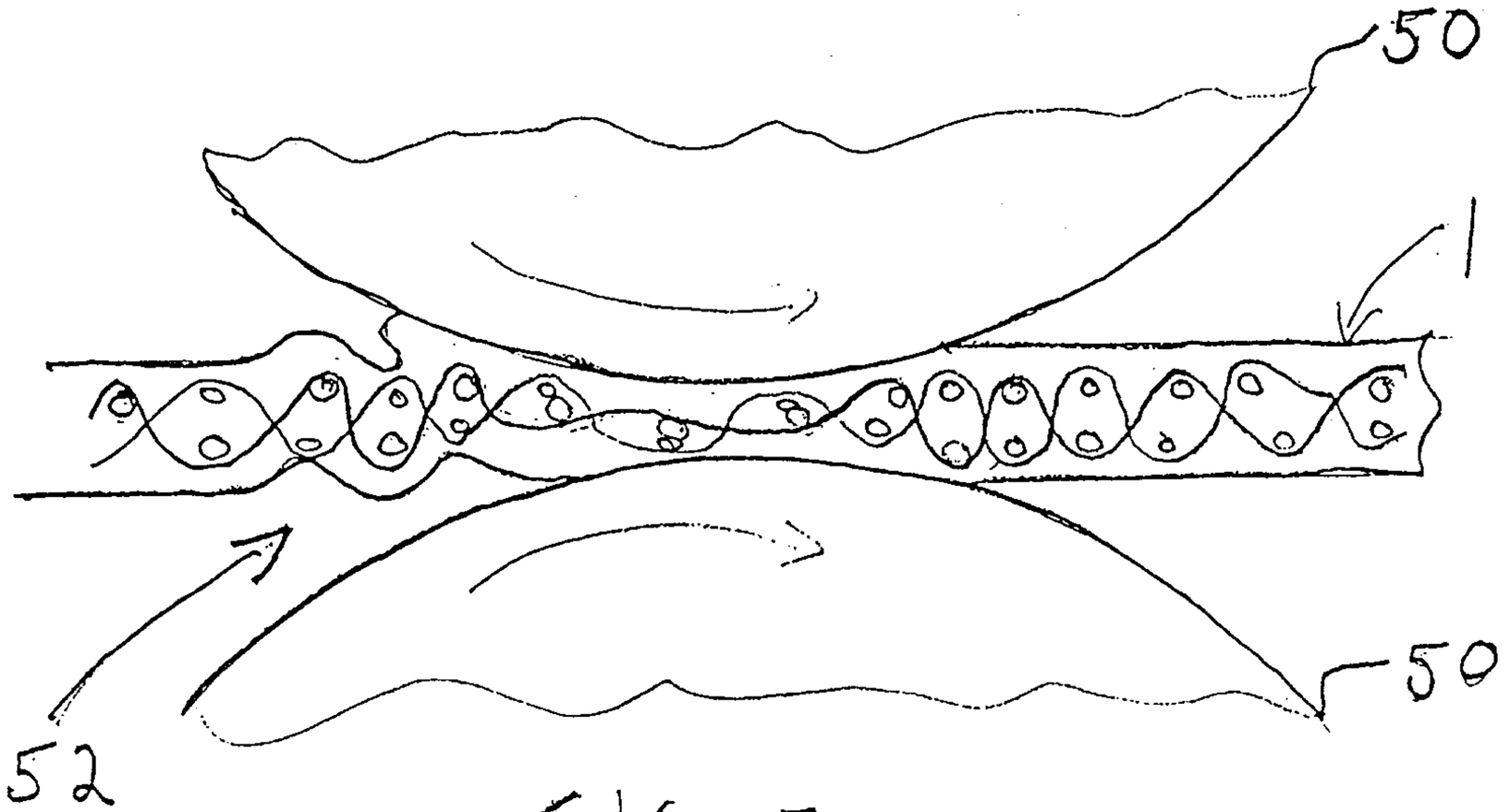


FIG. 3d

FIG. 4


First Heat Set
40 pli
340 F Cylinder
350 F Air Box
42
Second Heat Set
40 pli
340 F Cylinder
350 F Air Box
44
Third Heat Set
40 pli
250 F Cylinder
250 F Air Box
46



FIG, 5a

(prior art)

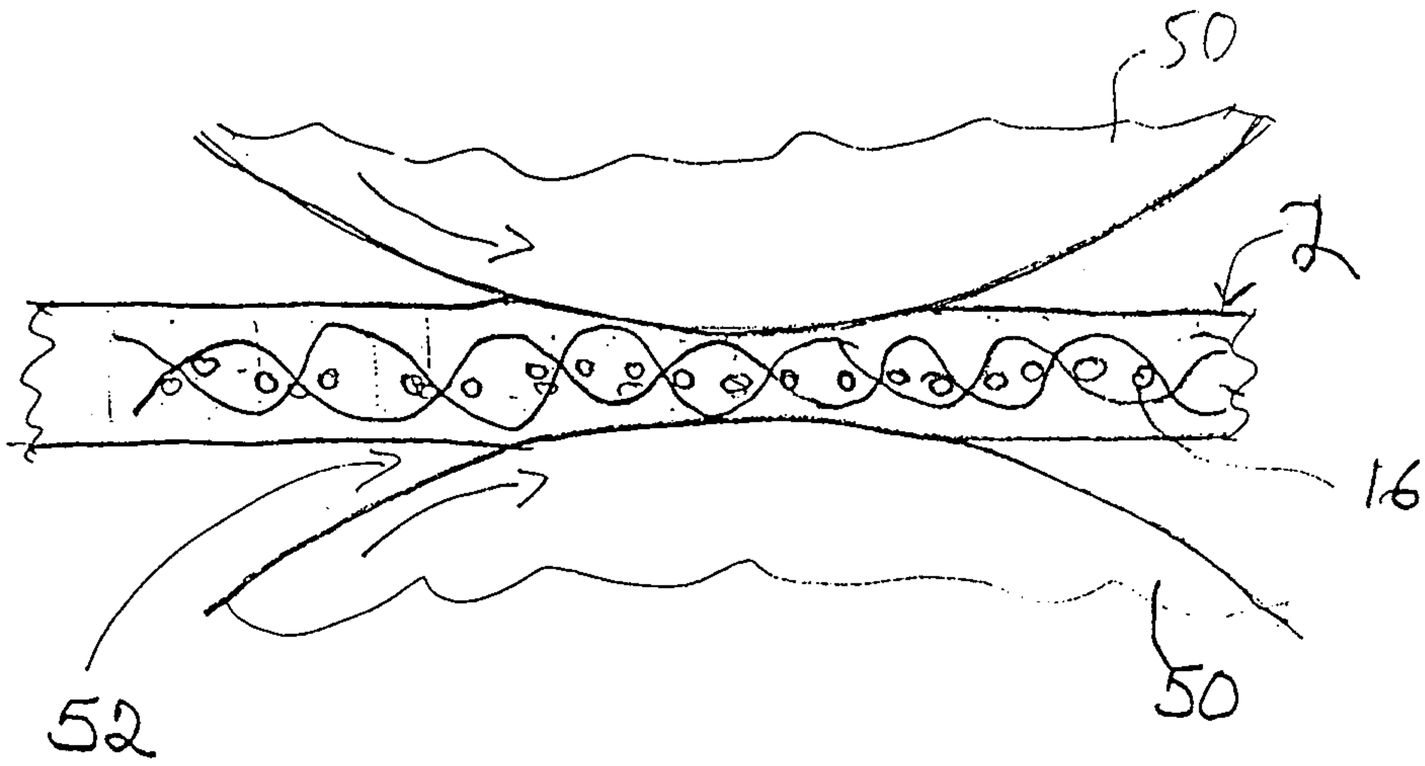


FIG. 5b

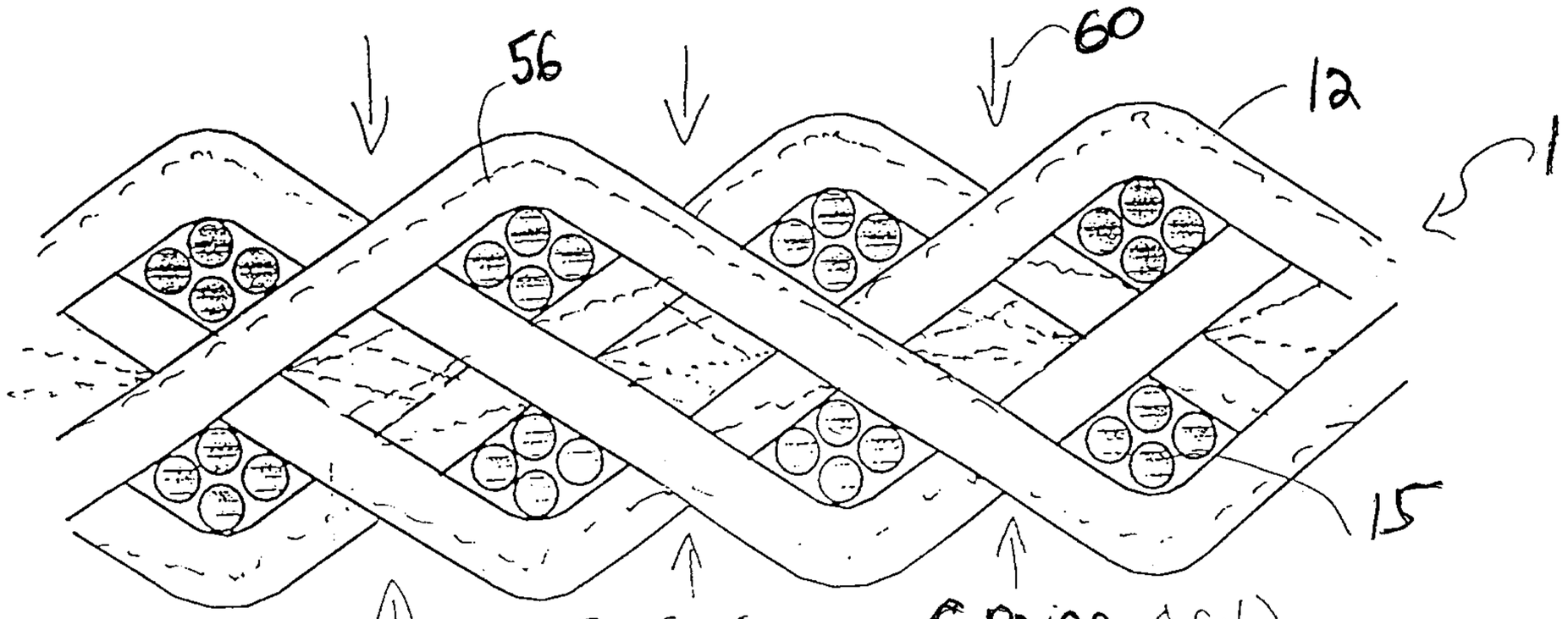


FIG 6a (Prior Art)

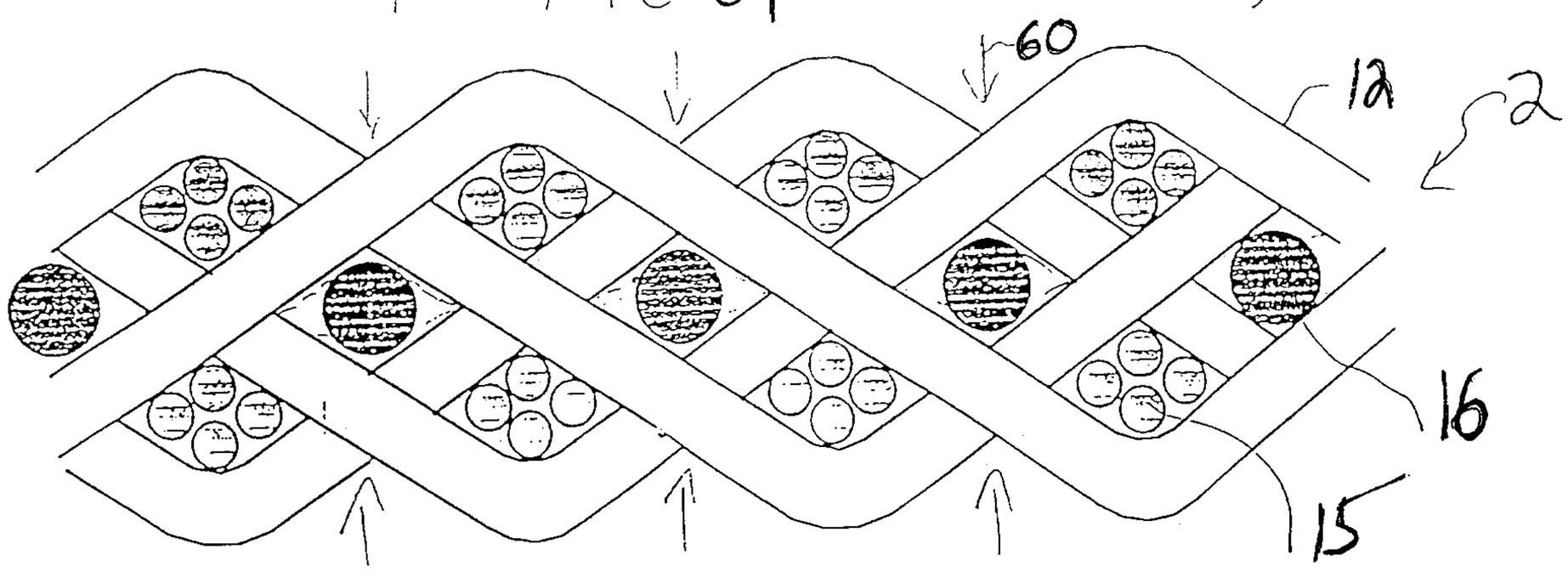


FIG 6b