US 20130048219A1

(19) **United States**

(12) **Patent Application Publication**

**Ferreiro**

(10) **Pub. No.: US 2013/0048219 A1**

(43) **Pub. Date: Feb. 28, 2013**

(54) **ADHESIVE THREAD SYSTEM**

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(21) Appl. No.: **13/594,415**

(22) Filed: **Aug. 24, 2012**

**Related U.S. Application Data**

(60) Provisional application No. 61/575,602, filed on Aug. 24, 2011.

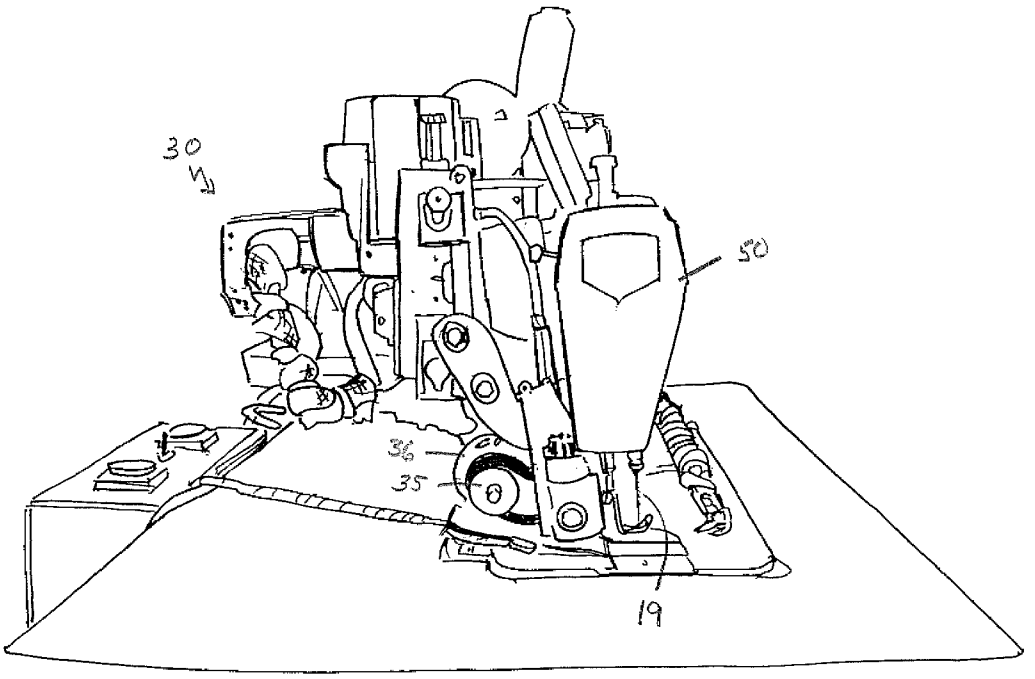
**Publication Classification**

(51) **Int. Cl.**
*B29C 65/72* (2006.01)

(52) **U.S. Cl.** ..... **156/513**

(57) **ABSTRACT**

A system for forming a waterproof seam between to sewn materials. The seam is formed using an adhesive coated thread. A thin strip of adhesive is placed between the two materials at the seam line. As the coated thread is sewn into the seam heat and pressure are simultaneously applied, melting the adhesive coating thereby filling the needle punctures. The melted adhesive coating will also flow into the areas between the needles punctures and between the materials. The heat and pressure applied to the coated thread will also melt the adhesive strip, causing additional adhesive to flow into the needle punctures and the areas between needle punctures.



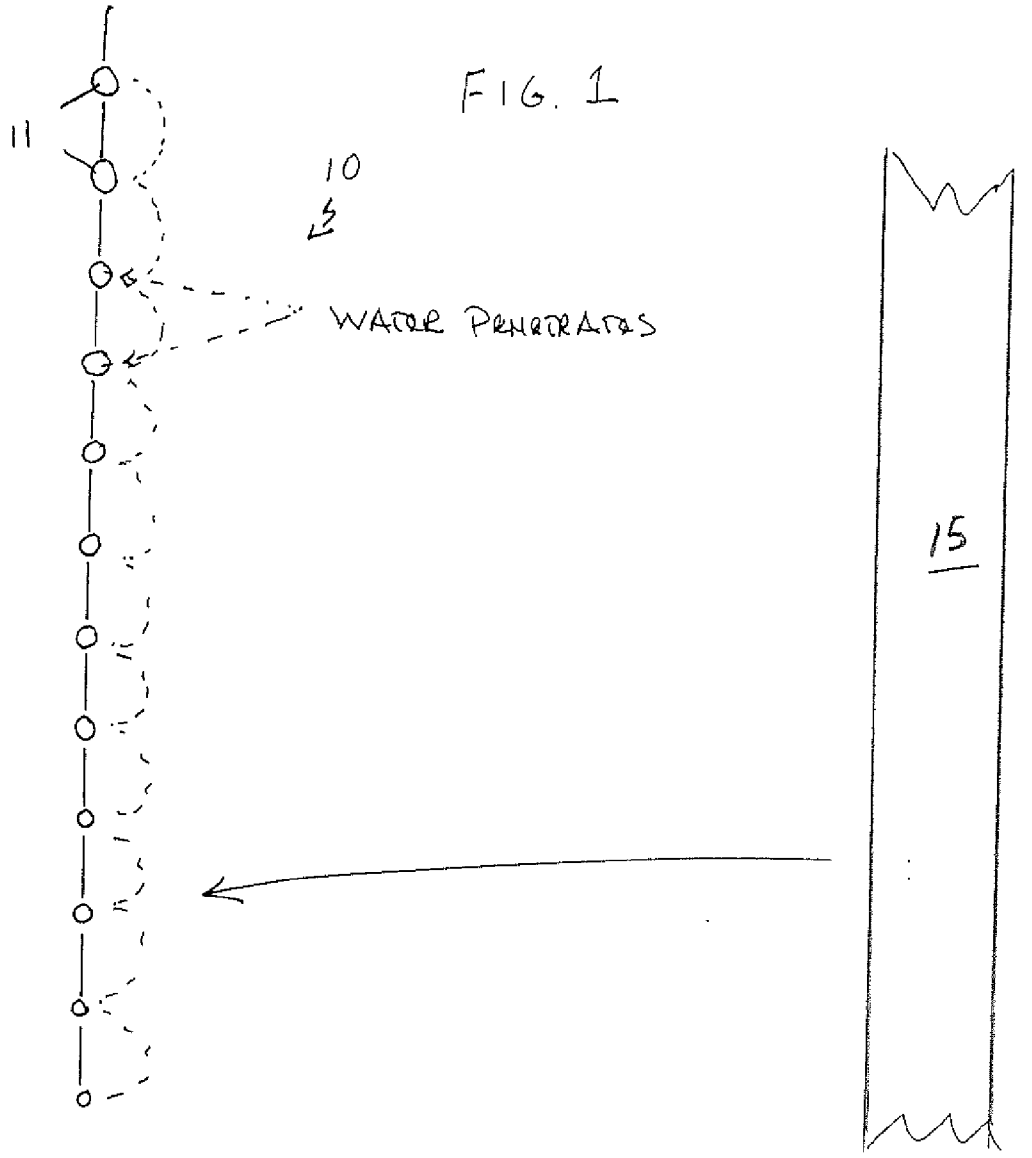



FIG. 1

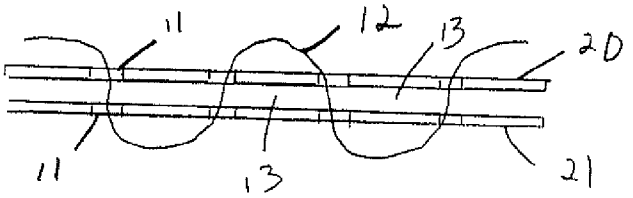
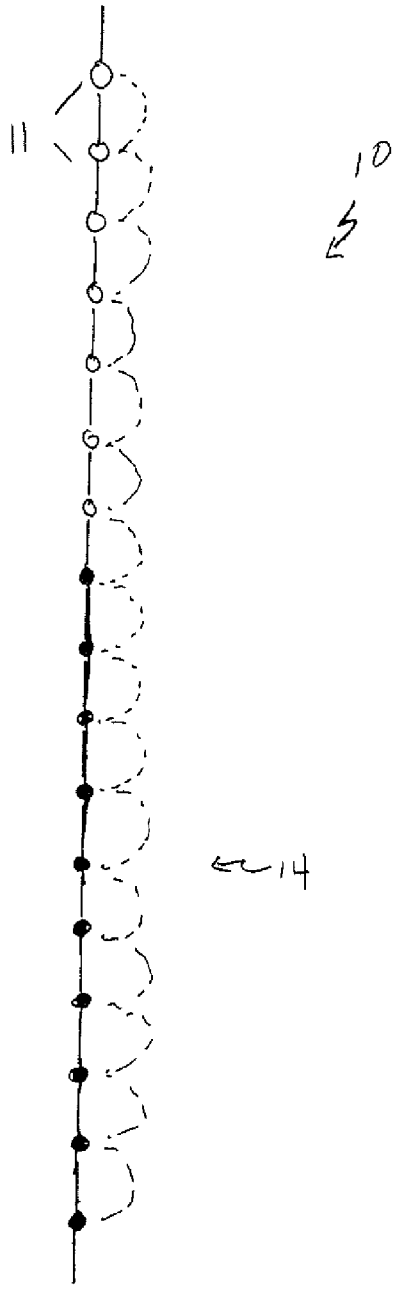
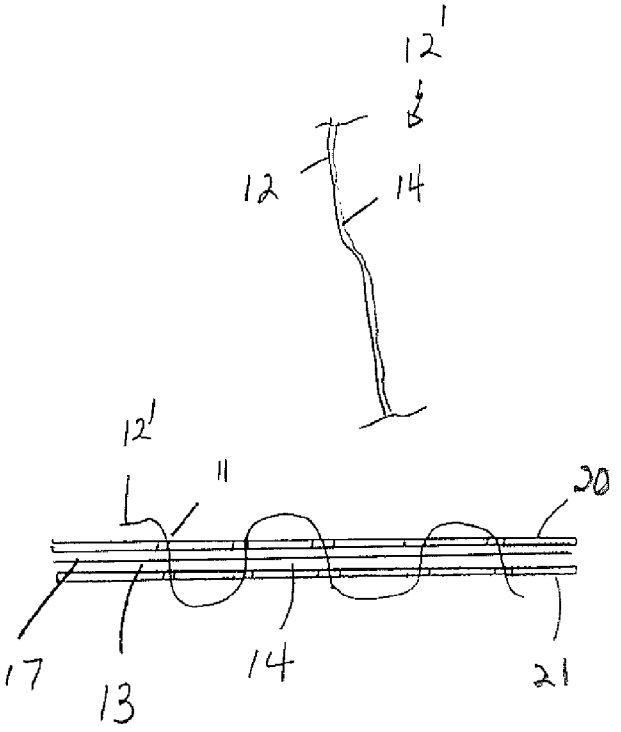



FIG. 2




F16.3




F16.4

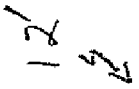





FIG. 7

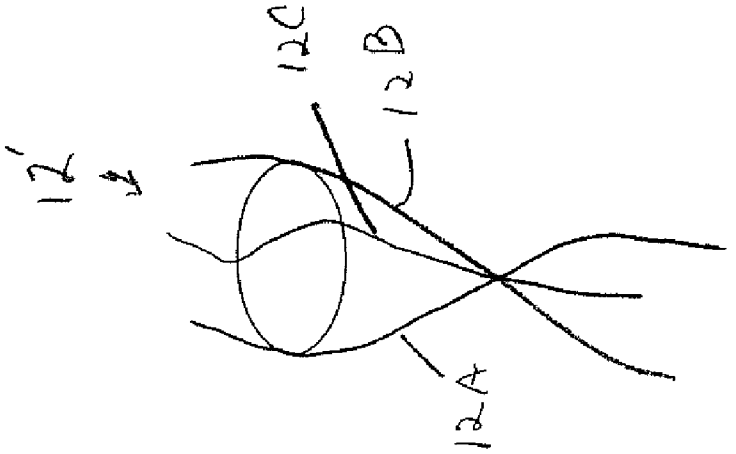



FIG. 6

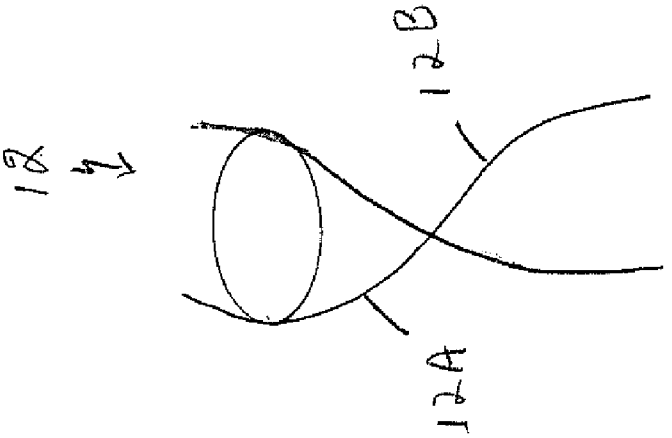



FIG. 5

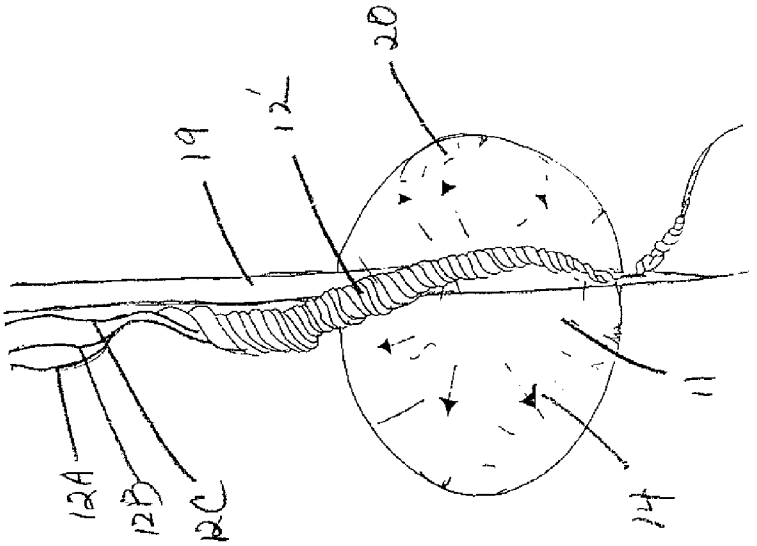



FIG. 9

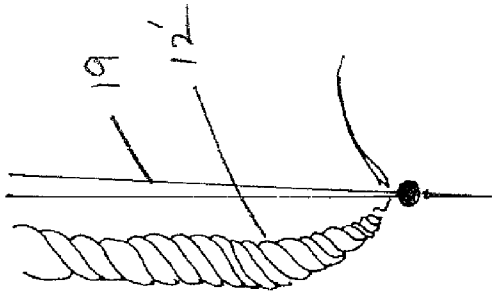



FIG. 10

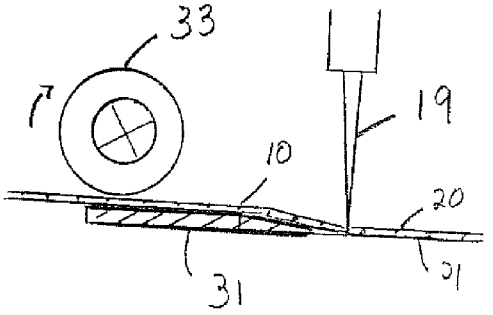



FIG. 10

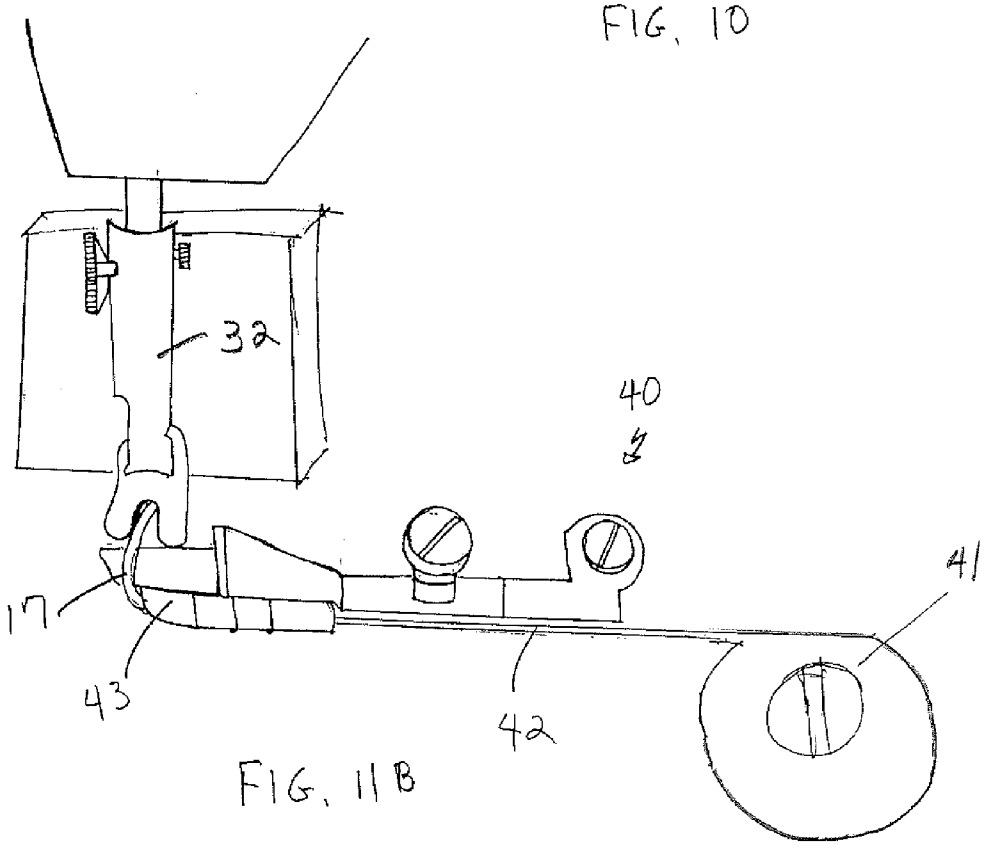



FIG. 11B

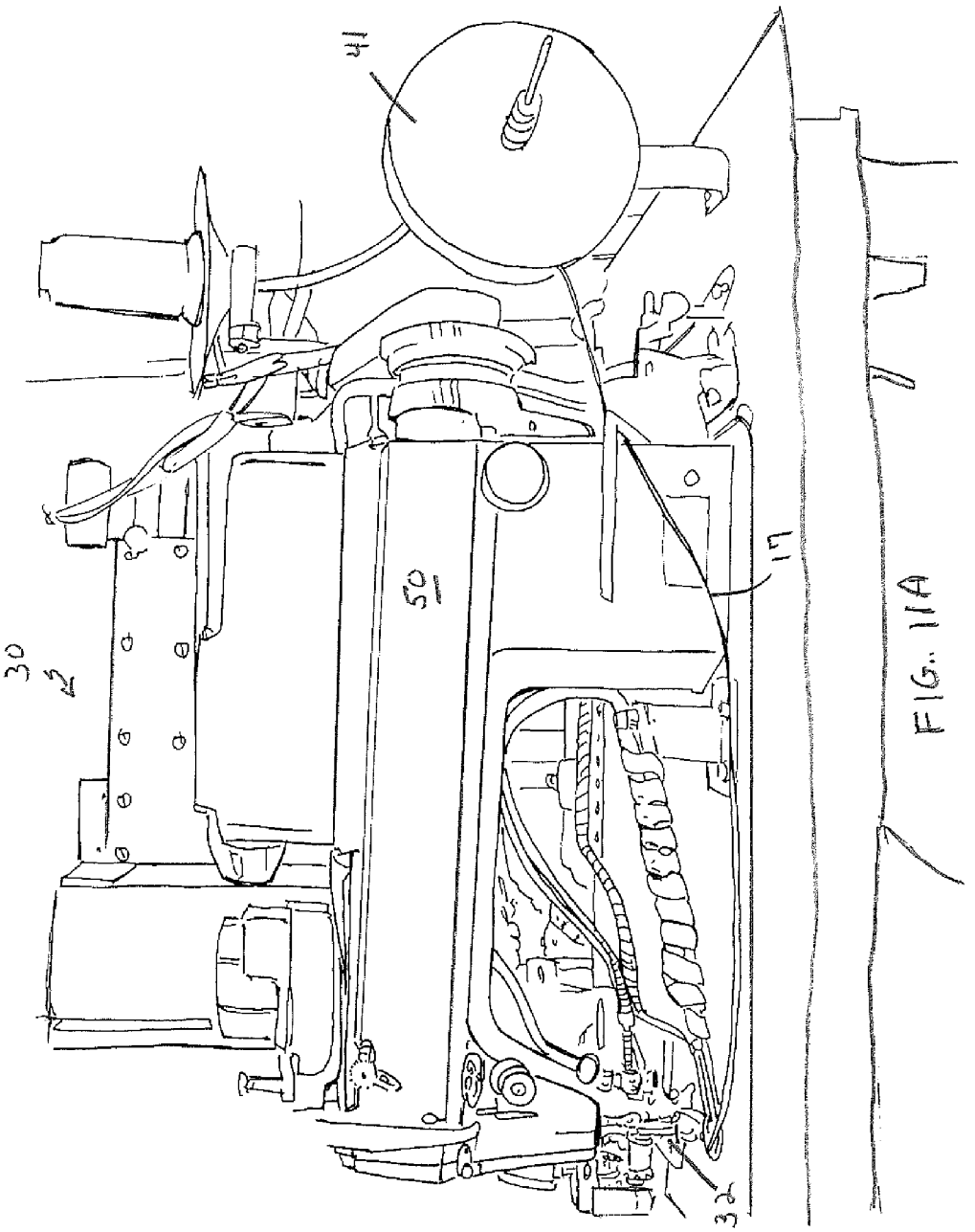



FIG. 11A

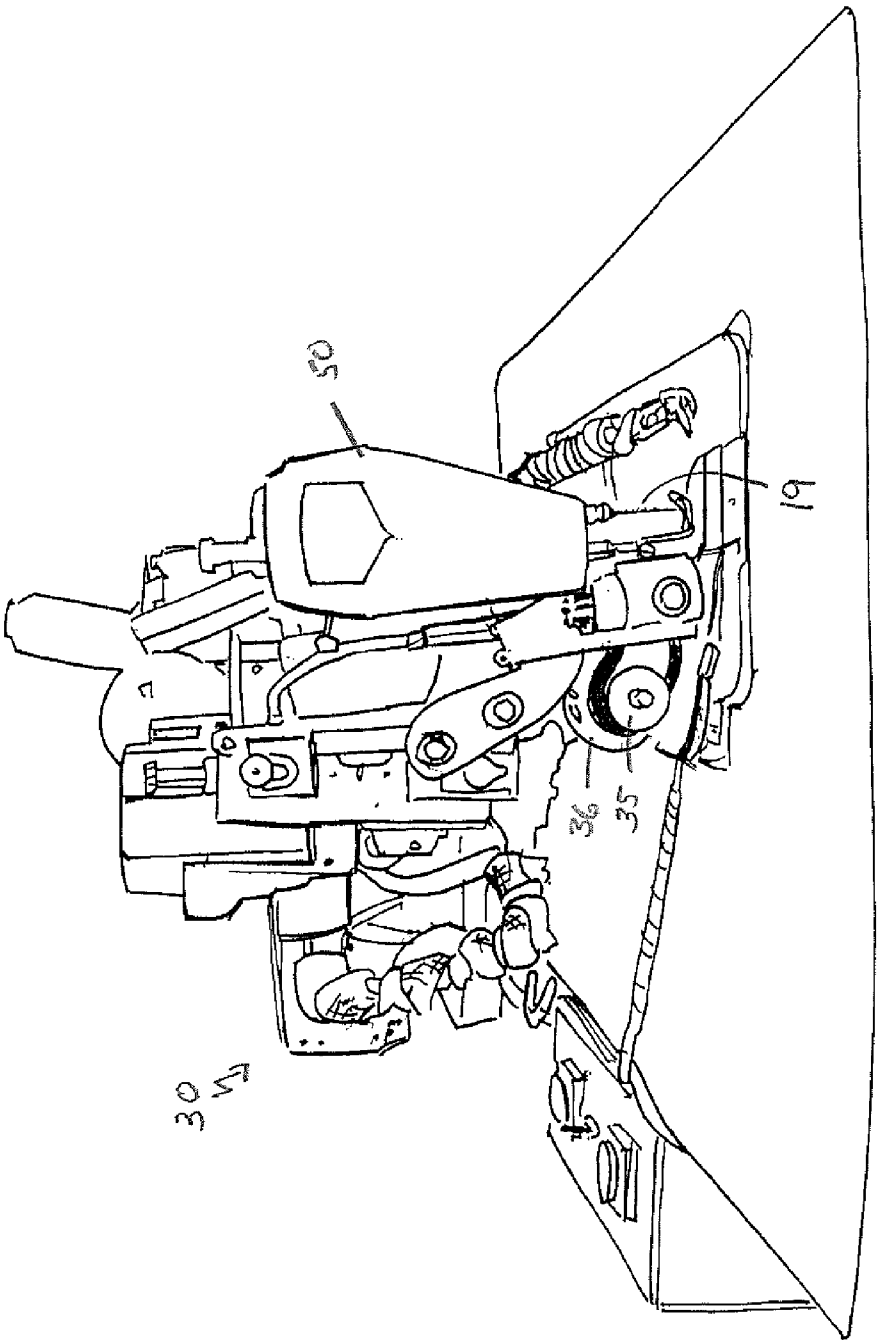
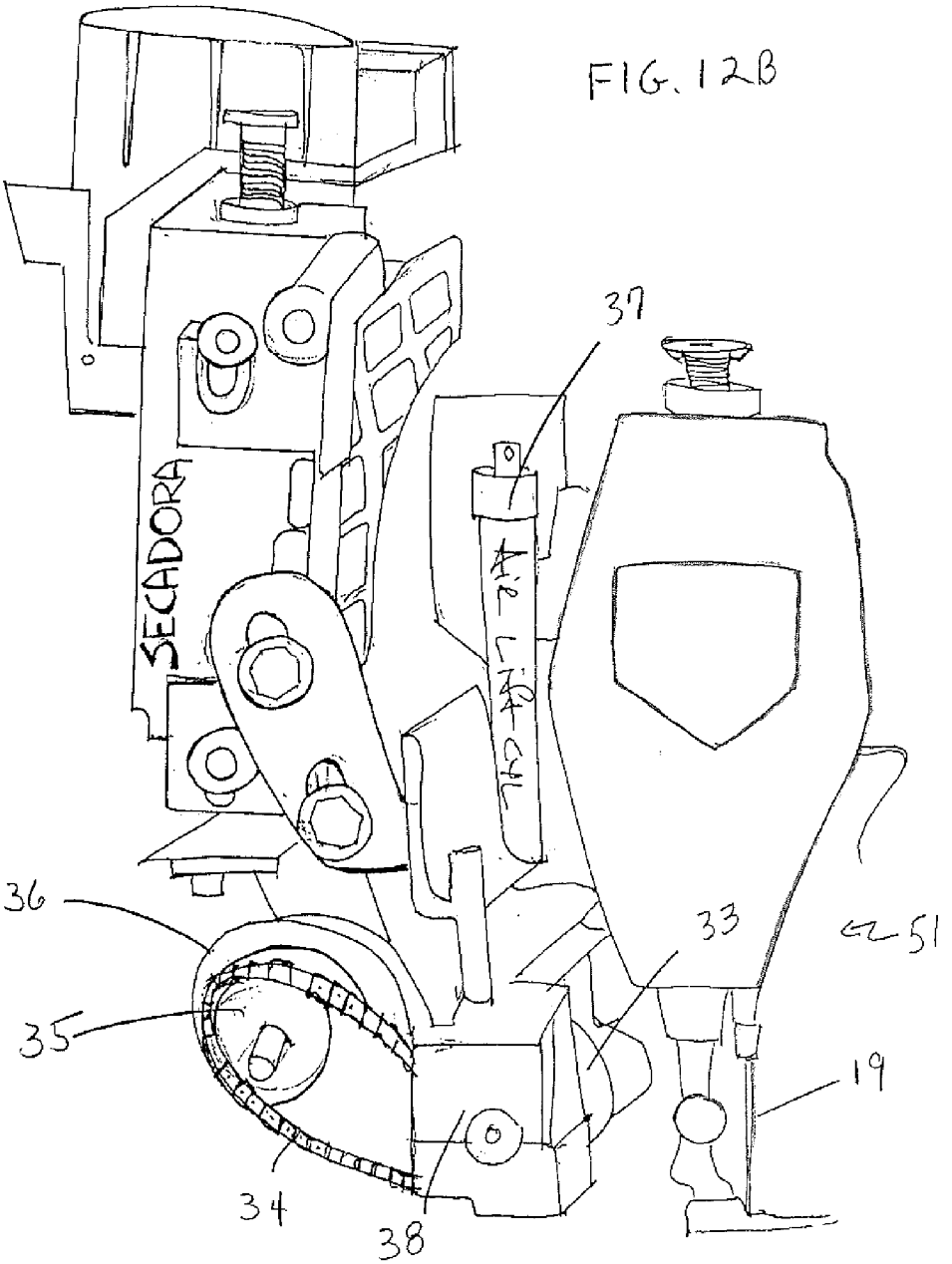



FIG. 12A

FIG. 12B



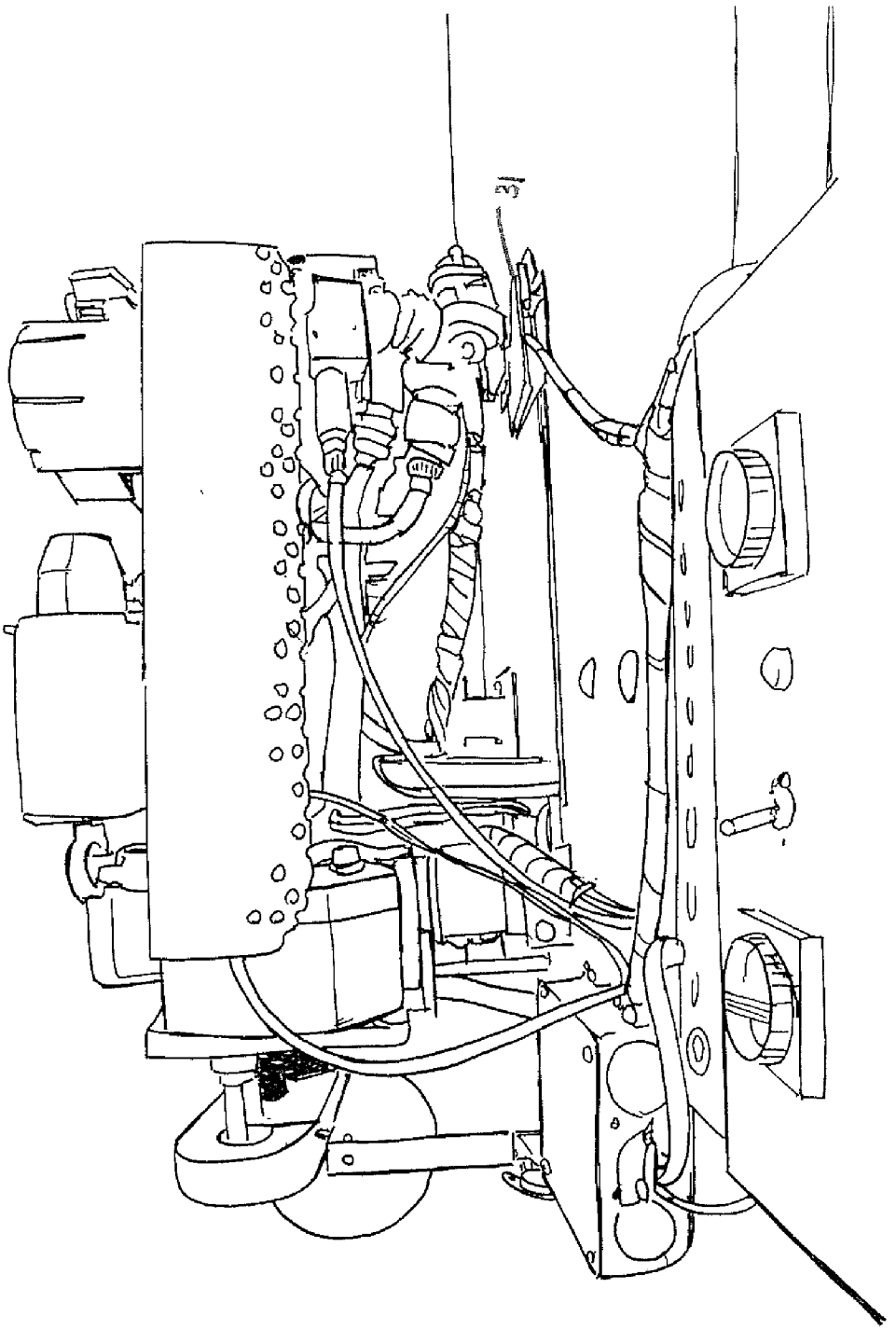



FIG. 13A

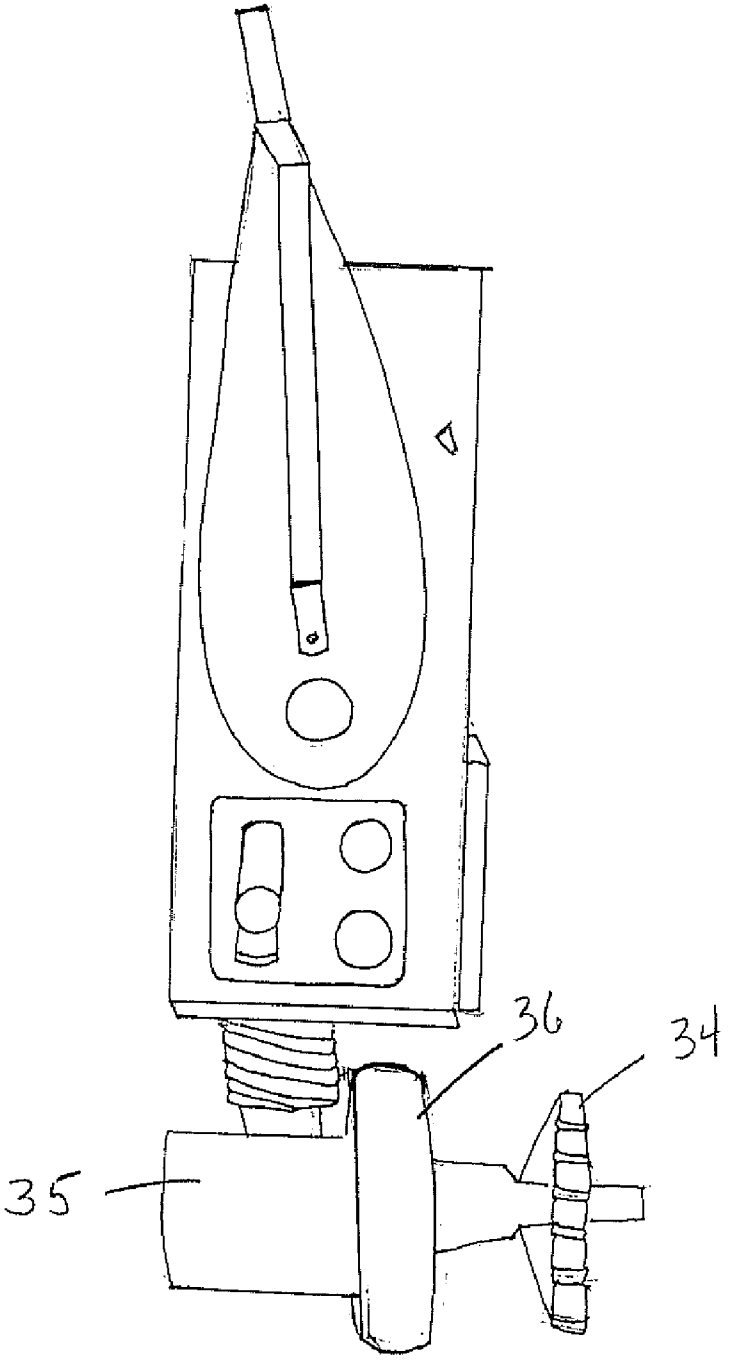



FIG. 13B

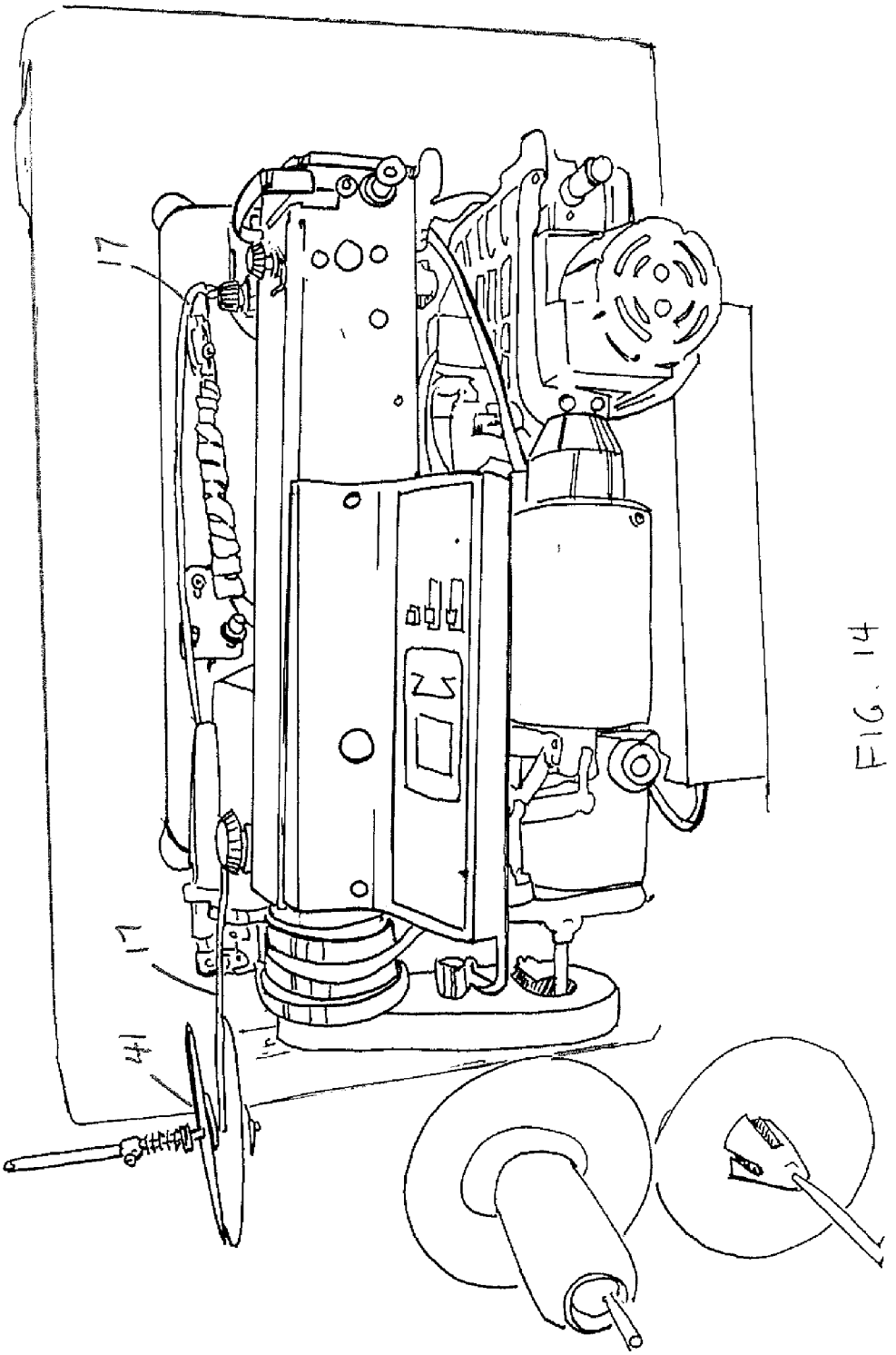



FIG. 14

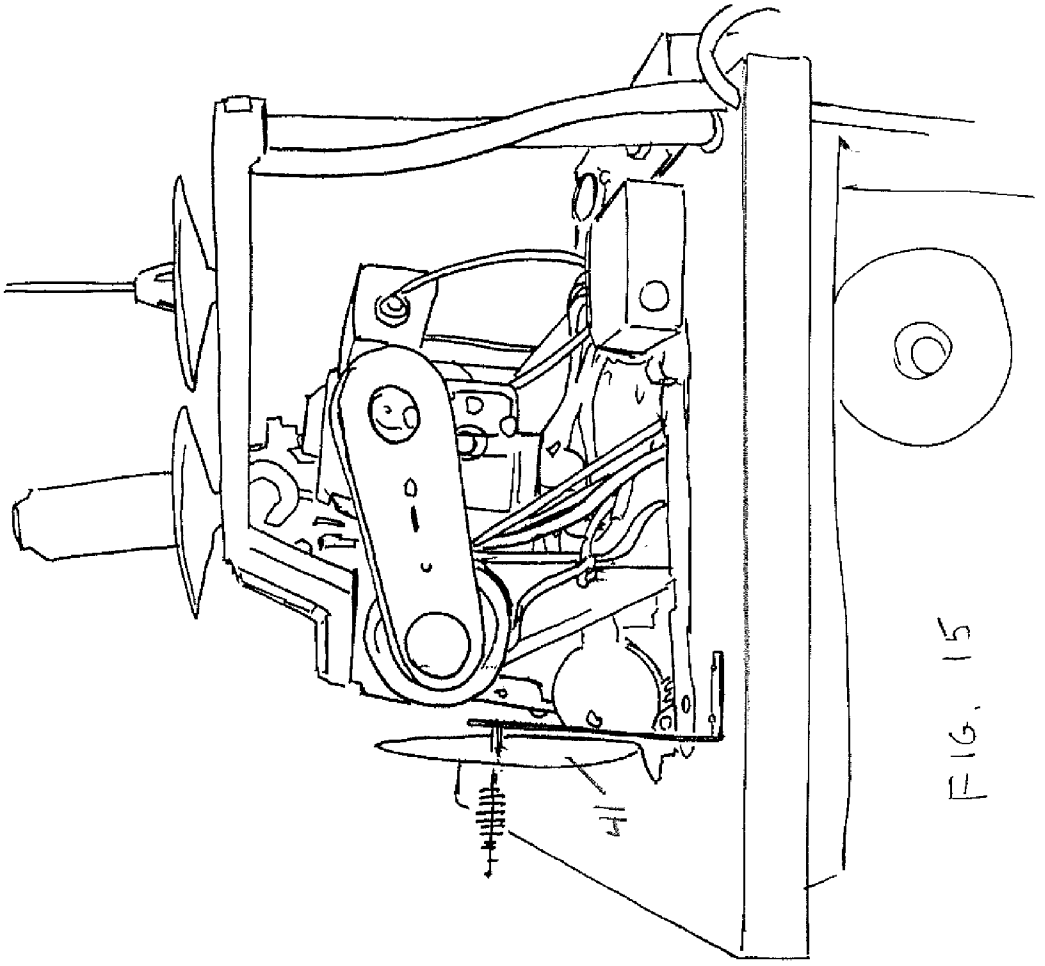



FIG. 15

# ADHESIVE THREAD SYSTEM

## CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** Applicant claims the priority benefits of U.S. Provisional Patent Application No. 61/575,602, filed Aug. 24, 2011.

## BACKGROUND OF THE INVENTION

**[0002]** This invention relates generally to the field of sewinq, and, in particular, to a system for making a waterproof seam.

**[0003]** In sewings, a seam is the join where two or more layers of fabric or other material are held together with stitches. The nature of sewing a seam is have a needle puncture a series of holes in the materials to be joined and simultaneously interleavening thread through the holes thereby fastening the materials to each other.

**[0004]** Many seam applications require the seam to be water resistant, and even water proof. Examples of this are outdoor clothing, tents, and sleeping bags. The problem with conventional seams is that water can pass through the holes alongside the thread, and also between the joined materials. The prior art addresses this problem by applying an adhesive tape over the seam thereby sealing the seam. The seal tape is a strip of adhesive coated material applied over the seam with a separate seam-sealing machine. This is costly both in the requirement of a separate machine and also, more importantly, in the extra labor required to operate the separate machine.

## SUMMARY OF THE INVENTION

**[0005]** The present invention addresses the problems inherent in prior art seam sealing by eliminating the need for seam tape thereby eliminating the need for a separate machine and the extra labor steps needed to apply the seam tape. The present invention accomplishes this by using a special thread coated with an adhesive. As the coated thread is inserted through the seam holes, heat and pressure are simultaneously applied thereby activating the thread coating. The activated thread coating melts into each cavity formed by a needle puncture. Applicant has found that the above process provides a highly water repellant seam. Full water proofing of the seam is accomplished by providing an additional thin adhesive strip between the materials to be joined along the seam line. The heat and pressure applied as the coated thread is inserted through the seam holes also melts the adhesive strip providing additional adhesive flow into the needle holes and between the seam holes of the materials to be joined.

**[0006]** The primary purpose of the present invention is to produce a highly water and wind repellent or waterproof and windproof seam. The present invention allows the waterproof/windproof process to be centralized and completed in one step, eliminating the prior art two-three step taping and sewing process. The present invention eliminates the requirement of a seal tape thereby reducing the bulk of conventional seal taping and the weight of the overall end item. The present invention facilitates machine operation in areas such as curves. Floor space required for seam sealing machinery is eliminated. The need for a seam seal operator is also eliminated. The overall time and cost for seam sealing is substantially reduced by the present invention. The present invention is particularly adapted for clothing, shoes, tents, sleeping bags, outdoor furniture, boating supplies, umbrellas, back packs and covers.

**[0007]** These together with other objects of the invention, along with various features of novelty, which characterize the invention, are pointed out with particularity in the following disclosure. For a better understanding of the invention, its operating advantages and the specific objects attained by its uses, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated a preferred embodiment of the invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0008]** FIG. **1** is a diagram of a prior art system.

**[0009]** FIG. **2** is an exploded side view of a prior art seam.

**[0010]** FIG. **3** is a diagram of the existing system.

**[0011]** FIG. **4** is an exploded side view of an invention seam.

**[0012]** FIG. **5** is a diagrammic view of a prior art two thread twist.

**[0013]** FIG. **6** is a diagrammic view of the invention three thread, Z-twist.

**[0014]** FIG. **7** is another view of the invention three thread.

**[0015]** FIG. **8** is a diagrammic view of the thread being sewed with a needle.

**[0016]** FIG. **9** is a magnified view of the invention thread being sewed into a fabric.

**[0017]** FIG. **10** is a side view of a seam, needle and top and bottom heating elements.

**[0018]** FIG. **11**A is a front view of the invention apparatus.

**[0019]** FIG. **11**B is a front view of a guide attachment for guiding the adhesive strip into the sewing chamber.

**[0020]** FIG. **12**A is a left side view of the invention apparatus.

**[0021]** FIG. **12**B is a partial right side view of the invention installed on a conventional sewing machine.

**[0022]** FIG. **13**A is a rear view of the invention apparatus.

**[0023]** FIG. **13**B is a partial rear view of the invention installed on a conventional sewing machine.

**[0024]** FIG. **14** is a rear top view of the invention apparatus.

**[0025]** FIG. **15** is a right side view of the invention apparatus.

## DETAILED DESCRIPTION OF THE INVENTION

**[0026]** Referring to the drawings in detail wherein like elements are indicated by like numerals, there is shown an FIGS. **1** and **2**, an example of a prior art waterproof seam **10**. The prior art seam **10** has a series of needle punctures **11** through which thread **12** is passed. In the example shown, two pieces of material **20**, **21** are being joined along the seam **10**. Water/moisture can pass through the punctures **11** along side the thread **12** and also between the joined material pieces **20**, **21** in the areas **13** between puncture holes **11**. A separate sealing tape **15** having an adhesive coating is placed over the seam **10** and adhered to the seam with heat and pressure. This second step provides a waterproof seam.

**[0027]** Referring to FIGS. **3** and **4**, the present invention seam **10** is formed using an adhesive coated thread **12'**. The coated thread **12'** is comprised of a thread **12** with an adhesive coating **14**. As the coated thread **12'** is applied, heat and pressure are simultaneously applied, melting the adhesive coating **14** thereby filling the needle punctures **11**. The melted adhesive coating **14** will also flow into the areas **13** between

the needle punctures **11** and between the materials **20**, **21**. This results in a highly water repellant seam. To make the seam absolutely water proof, a thin strip of adhesive **17** may be placed between the two materials **20**, **21** at the seam line **10**. The heat and pressure applied to the coated thread **12'** will also melt the adhesive strip **17**, causing additional adhesive to flow into the needle punctures **11** and the areas **13** between needle punctures.

**[0028]** Nearly 99% of the apparel industry uses a two thread clockwise twist. See FIG. **5**, wherein two threads, **12**A and **12**B are twisted together. The invention thread **12'**, as shown in FIGS. **6** and **7**, is formed with three threads, **12**A, **12**B and **12**C, twisted counter clockwise in a Z-twist, and coated with an adhesive **14**. Thus the thread **12'** may nominally be a 30/3 cotton count with three turns per inch minimum and having a left twist. This makes the thread puff up, further spreading the adhesive coating in each needle puncture hole. Referring to FIGS. **8** and **9**, there is shown a needle **19** inserting the invention thread **12'** through a magnified needle puncture **11**. The fibers from the coated thread **12'** expand and adhere to the needle hole **11**. The adhesive **14** from the coated thread seals the hole **11**. Additional adhesive **14** from the adhesive strip **17** will also contribute to filling the hole **11**. In the preferred embodiment, the thread is made from cotton. Polyester and nylon thread may also be used.

**[0029]** The adhesive coating **14** is nominally 2% to 6% coating by thread weight. The adhesives used in this example were Thermoplastic Polyurethane (TPU) adhesives. These adhesives bond to a wide range of substrates and very good properties. Other families of adhesives may also be uses such as nylon, polyester, polyolefin and vinyl.

**[0030]** An apparatus **30** designed to implement the above method is provoided. The apparatus **30** is preferably an add-on to an existing conventional sewing machine **50**. In the example shown, a single needle machine is shown. Double needle machines could as easily be used. The apparatus **30** must produce a sealed and sewn seam in one operation. The apparatus **30** must use the invention thread **12'** and adhesive strip **17** in the sewing assembly operation while transferring heat to the sewn seam **10** to activate the components of adhesive strip and thread adhesive. Heat must be applied in synchronization with the normal operation of sewing a garment. The heat contact must be intermittent and synchronised with the sewing machine start and stops. Heat transfer must be adequate to activate adhesives and sewing seam speed. The apparatus roller speed must match machine speed through the sewing operation.

**[0031]** The present invention sewing machine **30** has a single sewing needle **19** operated by conventional means. As the two materials **20**, **21** are brought together to form a seam **10**, the seam **10** is passed through the sewing chamber **32** containing a sewing needle **19**, between a plate **31** and a heater wheel **33**. The plate **31** and heater wheel **33** are separately heated. The heat from the plate **31** and wheel **33** melt the adhesive **14** coating the invention thread **12'**. The heat, combined with the downward pressure from the wheel **33**, react the adhesive forcing the adhesive into the needle puncture holes **11** and the area **13** between the two materials **20**, **21** forming the seam **10**. The heating plate **31** may be replaced with a roller.

**[0032]** The adhesive strip **17** is guided into the area **13** between the two fabric materials **20**, **21** by a seam guide **40** removably attached to the sewing machine front **51**. The guide **40** is comprised of an adhesive roll holder **41**, a linear guide attachment **42** from the roll holder, terminating in a curved sewing chamber guide **43** guiding the adhesive strip **17** between the two fabric materials **20**, **21** forming the seam **10**.

**[0033]** The invention is further comprised of a rotating horizontal element **35** electrically driven by the sewing machine **50** or an attachment to the sewing machine. The heater wheel **33** is geared to the rotating element **35** by means of a chain **34**. The chain **34** synchronizes the rotation of the heater wheel **33** with the sewing operation. The rotating element **35** also contains a puller wheel **36** for "pulling" the sewn seam **10** through and from the sewing machine **55**. The puller wheel may be used with or without the heater wheel **33**.

**[0034]** The heater wheel **33** is attached to a yoke **38**. In this embodiment of the invention, an airline cylinder **37** lifts and lowers the yoke **38** thereby lifting and lowering the heater wheel **33**.

**[0035]** It is understood that the above-described embodiment is merely illustrative of the application. Other embodiments may be readily devised by those skilled in the art, which will embody the principles of the invention and fall within the spirit and scope thereof.

I claim:

**1**. A system for making a waterproof seam, comprising:

a coated thread comprising thread with an adhesive coating;

means for forming a seam between two materials wherein a needle punctures a series of holes in said materials to be joined and simultaneously interleavens said coated thread through said holes thereby fastening the said materials to each other along a seam line;

means for placing a thin strip of adhesive between said materials at said seam line;

means for applying heat and pressure to the coated thread along said seam line.

**2**. A system for making a waterproof seam as recited in claim **1**, wherein:

said means for forming a seam between two materials is a conventional sewing machine;

said means for applying heat and pressure is comprised of a sewing chamber added to said conventional sewing machine, said sewing chamber comprising a sewing needle between a plate and heater wheel, wherein the two materials are brought together within said sewing chamber to form a seam, wherein said plate and wheel are separately heated, wherein the two materials are passed over said plate, wherein said wheel is positioned above and against said two materials over said plate.

**3**. A system for making a waterproof seam as recited in claim **2**, wherein:

said means for placing a thin strip of adhesive between said material at said seam line is comprised of a seam guide removably attached to a sewing machine front, said seam guide comprising an adhesive roll holder, a linear guide attachment from the roll holder, terminating in a curved sewing chamber guide guiding an adhesive strip from said roll holder into said sewing chamber between the said two materials the seam.

**4**. A system for making a waterproof seam as recited in claim **3**, further comprising:

a rotating horizontal element electrically driven by the sewing machine, wherein said heater wheel is geared to said rotating horizontal element by means of a chain,

wherein said chain synchronizes the rotation of the heater wheel with a sewing machine operation.

**5**. A system for making a waterproof seam as recited in claim **4**, wherein:

said rotating element contains a puller wheel for drawing a sewn seam through and from said sewing chamber.

**6**. A system for making a waterproof seam as recited in claim **5**, wherein:

said heater wheel is attached to a yoke driven by an airline cylinder which lifts and lowers the yoke thereby lifting and lowering the heater wheel.

**7**. A system for making a waterproof seam as recited in claim **6**, wherein:

the coated thread is formed with three threads, twisted counter clockwise in a Z-twist, and coated with an adhesive.

* * * * *