

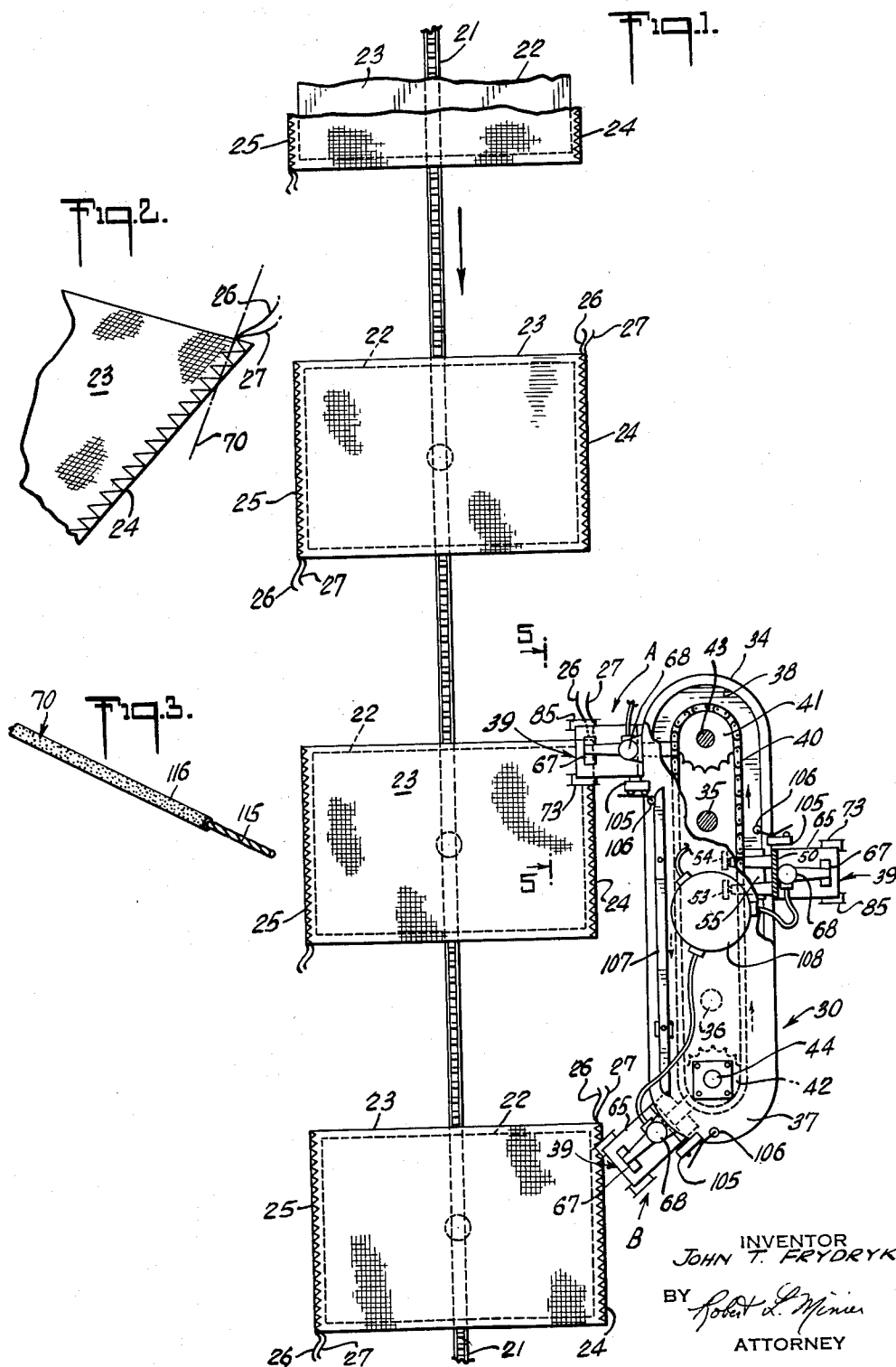
March 30, 1965

J. T. FRYDRYK
TAIL TACKING DEVICE

3,175,533

Filed Oct. 6, 1961

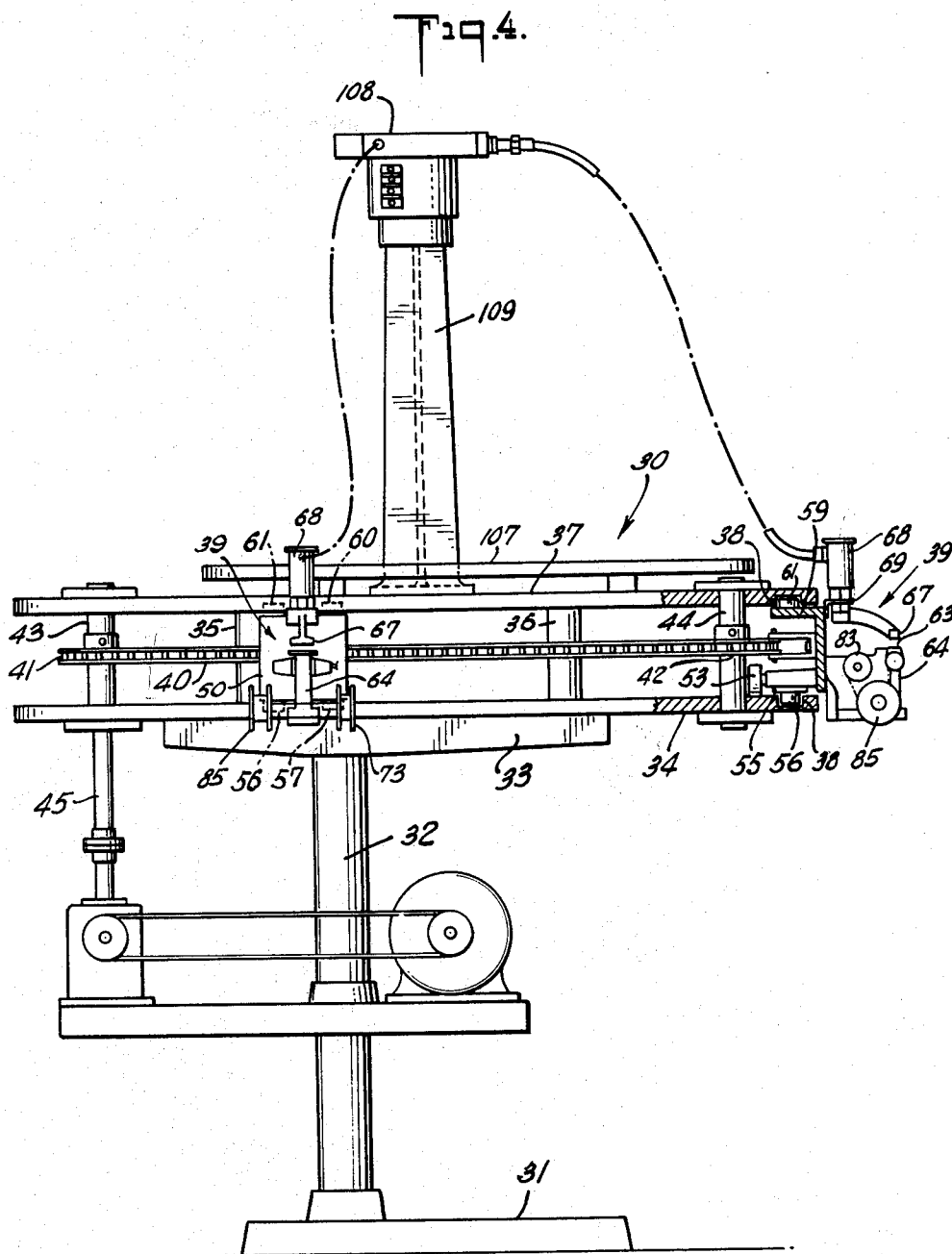
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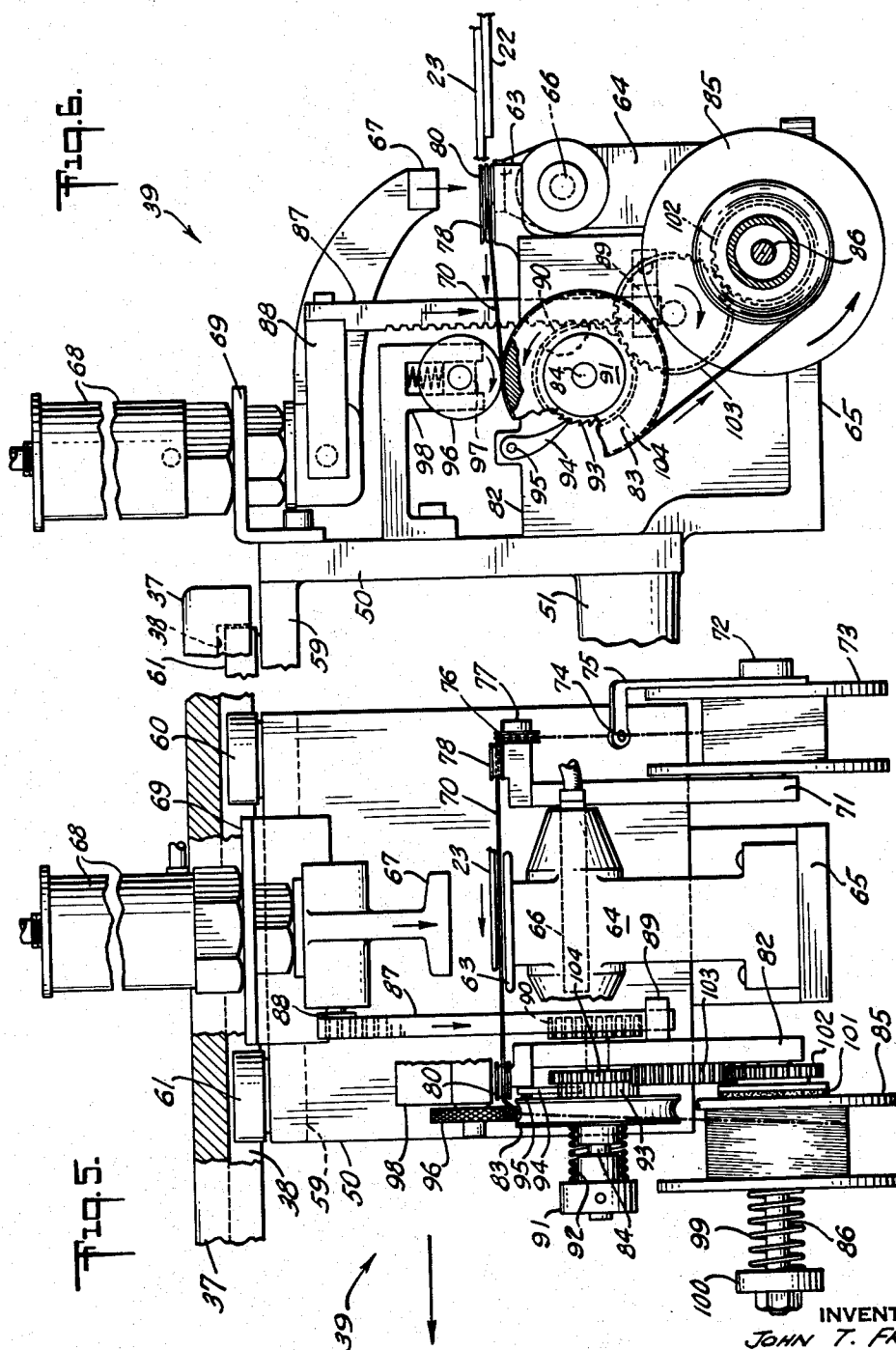
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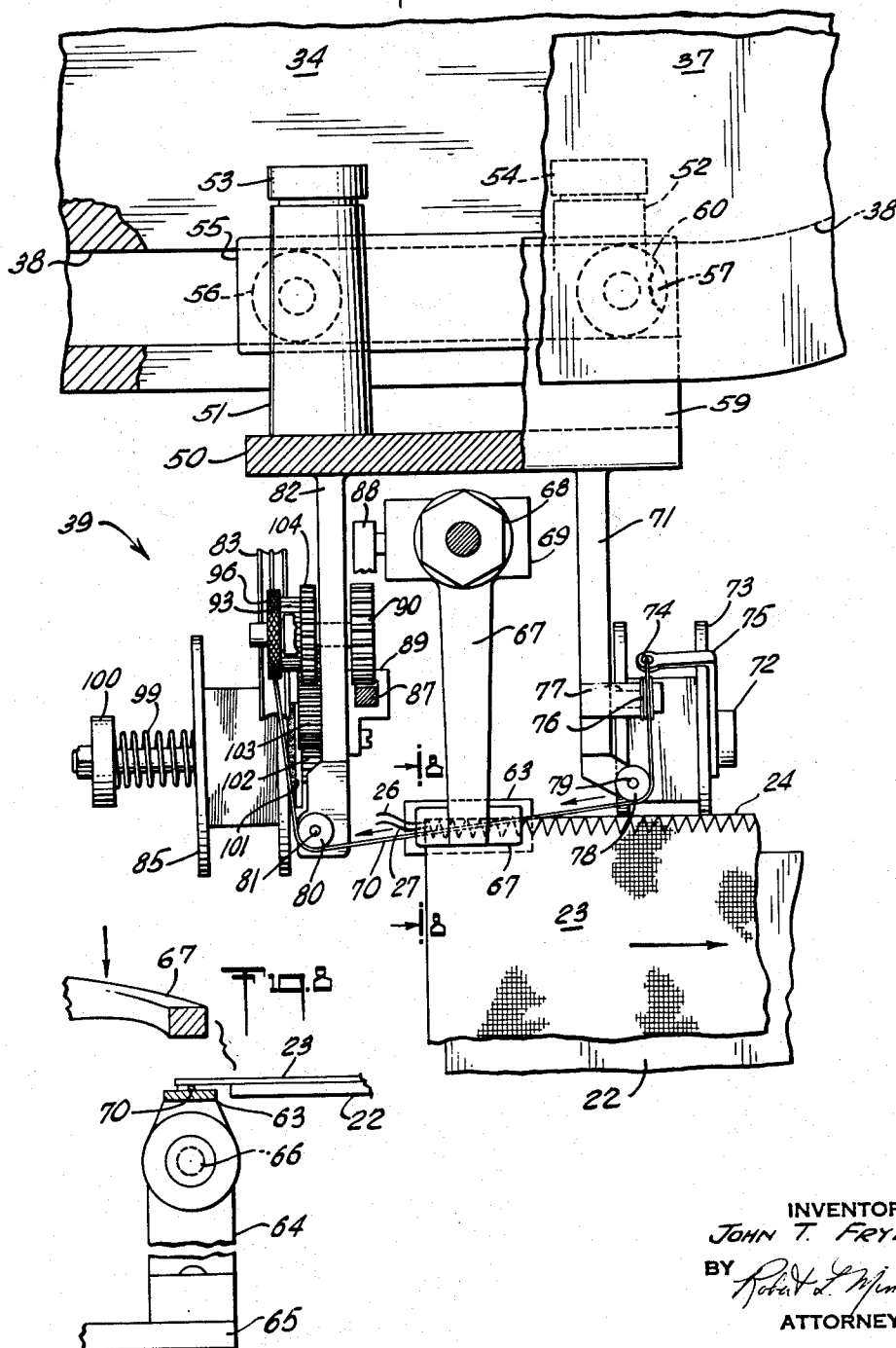
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Fig. 7.



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TAIL TACKING DEVICE

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The present invention relates to a method for depositing small amounts of a thermoplastic material on a series of objects, more particularly to a method for intermittently depositing small amounts of thermoplastic material on sewn seams of fabrics to prevent the sewing from unraveling and to a machine for carrying out such methods.

Generally, after a seam has been sewn, there are left at the end of the sewn seam one, two, or more thread ends which, in the absence of steps to prevent it, will unravel or pull out under tension or stress. Hence, if the sewn fabric is washed and dried a number of times the stitching may be partially and in some places completely removed. In order to prevent this detrimental unraveling during the life of the fabric it is necessary to tie down the loose thread ends or to stabilize the seam in some other manner. In the past, this has been accomplished by tying or by crocheting the thread ends. Both of such techniques require that relatively long, loose ends of thread remain at the end of a seam. But tying or crocheting is a hand operation which is expensive and time consuming.

In another technique the thread ends may be fixed by sewing a multiplicity of stitches at the end of the seam, but this is unsightly and may still pull out if sufficient stress is applied.

It has been suggested to place a drop of liquid adhesive on the thread ends to adhere them together and prevent their unraveling, but no successful technique for accomplishing this expedient has been forthcoming.

In accordance with the present invention a small controlled and uniform amount of a thermoplastic material is applied in close proximity to the thread ends of a sewn seam to stabilize the stitches and prevent unraveling. The method is continuous and the machine for the most part is automatically operated.

More specifically, small amounts of thermoplastic material are applied to successively advancing spaced portions of sheet material. This is accomplished by applying heat and pressure to successive lengths of a carrier filament having a continuous coating of thermoplastic material thereon while such lengths are in contact with successively advancing spaced portions of the sheet material to transfer portions of the thermoplastic adhesive coating from the carrier filament to the sheet material.

In using this method to stabilize a stitched seam, the transferred thermoplastic material is applied on the sewn seam in close proximity to the thread ends to prevent the thread ends from being pulled or unraveled beyond the point where the thermoplastic material is located.

A better understanding of the invention may be had from the following description read in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a diagrammatic plan view of a machine embodying the present improvement.

FIGURE 2 is an enlarged perspective view of a fabric seam showing the relationship of the seam to the carrier filament during the application of the adhesive.

FIGURE 3 is an enlarged fragmentary view of a carrier filament with its thermoplastic coating.

FIGURE 4 is a side elevation of a machine which indexes the carrier filament and transfers a thermoplastic coating from the filament into adhering relationship with the sewn seam.

FIGURE 5 is an enlarged front elevation, parts being

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shown in section and viewed in the direction of the arrow 5—5 of FIGURE 1.

FIGURE 6 is an end elevation of that portion of the machine shown in FIGURE 5 looking at the parts from the left in FIGURE 5.

FIGURE 7 is a plan view of that portion of the machine shown in FIGURE 5, parts being omitted, broken away and in section for clarity.

FIGURE 8 is a sectional view taken along line 8—8 of FIGURE 7.

As shown in FIGURE 1, a continuously advancing chain conveyor 21 supports at spaced intervals therealong a series of horizontal plates 22 for supporting rectangular pieces of fabric 23. Each piece of fabric may have a pair of sewn seams 24 and 25 along two opposite edges and is located on its supporting plate 22 so that the terminal end of the seam from which unraveling will start during subsequent use and which presents a pair of thread ends 26 and 27, is the trailing end of the seam on one edge of the fabric and the leading end of the seam on the other edge. The conveyor 21 advances in the direction of the arrow shown.

Immediately adjacent the conveyor 21 there is a machine 30 for depositing thermoplastic material in accordance with this invention. This machine 30 is more clearly shown in FIGURE 4 and comprises a base 31 on which there is an upright stanchion 32 which supports a horizontal platform 33. The platform 33 supports at the top, two horizontal plates 34 and 37 spaced apart in a vertical direction. The lower plate 34 sits directly on the platform and in turn supports a pair of vertically disposed columns 35 and 36 spaced along the center line of the lower plate and on which the upper plate 37 rests. On the top side of the lower plate and on the under side of the upper plate there is a groove or track 38 located adjacent to their respective peripheries. Traveling in this track along the peripheries of the plates are three heads 39 for applying the thermoplastic material. The heads 39 are spaced equidistantly along and are attached to a drive chain 40. The drive chain 40 is horizontally disposed, is centrally located between the upper and lower plates 37 and 34, is spaced inwardly from the peripheries of the plates and its path of travel is parallel to said peripheries.

The drive chain 40 is guided in its path of movement by a pair of sprockets 41 and 42 fixed on vertical shafts 43 and 44, journaled for rotation in the upper and lower plates 37 and 34 near the opposite ends thereof. The shaft 43 on which the sprocket 41 is fixed has a depending extension 45 for connection with a motor drive.

As shown in FIGURES 5, 6 and 7, each thermoplastic depositing head 39 includes a vertical apron 50 which presents, near its lower edge, a pair of parallel, horizontal, cylindrical bosses 51 and 52 extending inwardly toward the center of the supporting plates 34 and 37. These bosses are equipped at their inner ends with rollers 53 and 54 which track along the top of the lower plate 34 to support the head as it travels around the periphery of the plates 34 and 37. A horizontal bracket 55 depending from the bosses supports a pair of horizontal rollers 56 and 57 on its underside which engage in the groove or track 38 disposed in the top surface of the lower plate. A somewhat similar horizontal bracket 59 supported by the apron near its upper edge and which likewise extends inwardly towards the center of the plates 34 and 37 supports a pair of horizontal rollers 60 and 61 on the top side thereof and this pair of rollers engages in the track or groove 38 disposed on the underside surface of the upper plate.

The support rollers 53 and 54 and the guide rollers 56, 57, 60 and 61 running in the grooves 38 control the

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path in which the head 39 moves around the plates 34 and 37 under the influence of the drive chain 40 to which it is attached.

The heads move in the direction of the arrow shown in FIGURE 1 on their advance or active stroke and are synchronized with the movement of the chain conveyor 21 and the fabric supporting plates 22 in a way such that when the thread ends 26 and 27 of a sewn seam of a fabric item 23 reach location A as is shown in FIGURE 1, one of the thermoplastic depositing heads 39 simultaneously reaches the same location. The head and the fabric then move at the same speed to location B where separation of the two occur. The head 39 continues in its path around the grooved plates 34 and 37 until it again reaches location A, while the fabric item moves on for further processing. The other heads 39 track around in like manner for operation on the next two subsequent fabric items.

The operation of the thermoplastic depositing head as it moves about the track will now be described.

As the head 39 arrives at location A, a horizontal, heated anvil 63 carried by it is presented beneath the fabric item 23 which arrives there at the same time as the location of the thread ends 26 and 27. The anvil 63 is supported at the top of a vertical column 64 which is fixed on a horizontal portion 65 integral with and which extends outwardly from the apron 50 of the head at the lower end thereof. The anvil is heated by a cartridge heater 66 located directly in the column support 64 and which is suitably energized from a source not shown.

A pressure foot 67 located above the anvil for movement in a vertical direction is adapted when in its lowermost position to clamp the fabric to the anvil and when in its uppermost position to stand clear of the anvil to permit relative movement of the fabric therebetween. The pressure foot 67 is fixed at the lower end of a vertically movable piston rod of a double-acting cylinder and piston device 68 mounted on a bracket 69 fixed to the apron at the top. In a manner hereinafter described when air under pressure is admitted to the cylinder above the piston and the cylinder below the piston exhausted to the atmosphere, the pressure foot is caused to descend whereas when air is admitted to the cylinder below the piston and the cylinder above the piston exhausted, the pressure foot is caused to ascend. At the same time that the pressure foot clamps the fabric, it also clamps in close contact therewith a section of filament coated with thermoplastic material 70 whose thermoplastic coating is transferred to the fabric and to the thread ends of the seam under the action of the heated anvil, thereby to tack the thread ends to the fabric and prevent unraveling.

On each depositing head 39 near the leading edge of the apron 50 there is mounted a vertical plate 71 extending outwardly from the apron. Fixed in this plate 71 and extending in the leading direction is a horizontal stud 72 disposed parallel to the apron 50. This stud 72 is adapted rotatably to support a supply spool 73 of the thermoplastic coated carrier filament 70.

The thermoplastic carrier filament passes upwardly from the supply spool 73 through an overlying guide eye 74 in the horizontal leg of an angularly shaped arm 75 fixed on the spool-supporting stud 72.

After passing through the guide eye 74 the carrier filament 70 continues in an upwardly direction and over a vertical guide pulley 76 rotatably mounted at approximately the level of the heated anvil 63 on a horizontal shaft 77 extending forwardly from the spool-supporting vertical plate 71 near the top thereof.

The carrier filament 70 then travels in a horizontal plane outwardly from the apron 50 to a horizontal guide pulley 78 supported at approximately the same level as the heated anvil 63 and at a position just inwardly from

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the heated anvil. This guide pulley 78 is rotatably mounted on a vertical pin 79 extending upwardly from the top edge of the vertical plate 71.

At the same level as the horizontal pulley 78 just mentioned and about its same distance from the heated anvil 63 but on the trailing side of the heated anvil there is a second horizontal guide pulley 80 rotatably mounted on a vertical pin 81 extending upwardly from a vertical plate 82 similar to the vertical plate 71. Vertical plate 82 is integral with and extends outwardly from the trailing edge of the apron 50.

The carrier filament 70 passes from the first horizontal guide pulley 78 to the second horizontal guide pulley 80 and in doing so passes between the heated anvil 63 and the pressure foot 67.

After passing around the second horizontal guide pulley 80 the carrier filament passes inwardly towards the apron 50 to a large vertical pulley 83 rotatably mounted on a horizontal shaft 84 extending parallel with the apron and journaled for rotation in the vertical supporting plate 82 to which reference has just been made.

The carrier filament passes around the large vertical pulley 83 and downwardly to a take-up roll 85 rotatably mounted on a second horizontal shaft 86 parallel to and beneath the first horizontal shaft 84. The second horizontal shaft 86 is likewise mounted in the vertical supporting plate 82.

The carrier filament is wound on the take-up roll 85, its thermoplastic coating has been removed by the cooperating heated anvil 63 and pressure foot 67 as hereinafter described.

Successive lengths of the coated carrier filament are positioned between the anvil 63 and the pressure foot 67 for removal of the thermoplastic coating by the descent of the pressure foot which causes the fabric item and the thermoplastic coated carrier filament to be pressed against the heated anvil so that the thermoplastic coating is removed from the carrier filament and caused to adhere to the fabric item. The pressure foot is then caused to ascend so that the fabric item may be removed from between the pressure foot and the heated anvil and another length of thermoplastic coated carrier filament fed therebetween for application to the next fabric item.

Feeding of the carrier filament is effected upon the ascent of the pressure foot. To this end a vertical rack 87 is fixed at the outer end of a horizontal bar 88 which is pinned to the pressure foot where the latter is connected to the piston of the piston and cylinder device 68, and is guided for movement in a vertical direction by a bracket 89 fixed to the vertical plate 82 at the front side thereof.

The vertical rack 87 meshes with a gear 90 fixed near the leading end of the first horizontal shaft 84 which passes through the vertical plate 82. A collar 91 fixed at the opposite end of the shaft 84 provides a buttress for a compression spring 92 which encircles the shaft 84 and presses against the large pulley 83 around which the thermoplastic carrier is fed. The pulley 83 which, as will be recalled, is rotatably arranged on the shaft 84, forms part of a unit which includes the ratchet 93 of a pawl and ratchet mechanism whose pawl 94 depends from a pin 95 fixed in the vertical plate 82 and is spring pressed into engagement with the ratchet 93. According to this arrangement, the pulley unit (i.e., the large pulley 83, the ratchet 93 and the gear 104) is held against rotation by the pawl and ratchet mechanism as the rack descends under the influence of the pressure foot, but is caused to rotate as permitted by the pawl and ratchet mechanism, as the rack ascends, by virtue of the torque transmitted from the rotating collar 90 to the pulley 83 through the intermediate compression spring 92. As the pulley 83 rotates, the thermoplastic carrier is caused to be pulled along as an overlying roller 96, whose hub rotates in a vertically floating journal 97 which is guided for vertical

movement in a bracket 98 fixed on the apron 50, is spring pressed downwardly to urge the carrier 70 into contact with the pulley 83.

The carrier thread 70 from which the thermoplastic coating has been removed and which is pulled along by the large pulley 83 is wound on a spool 85. The spool 85 for this purpose is rotatably mounted on a stub shaft 86 which is parallel to and located somewhat below the shaft 84 on which the pulley unit is mounted and which is supported at one end in the vertical plate 82. To effect its rotation, a compressive spring 99 encircling the shaft 86 and buttressed by a collar 100 fixed on the shaft 86 at its outer end presses the spool 85 against a friction disc unit which is rotatably mounted on the shaft. The friction disc 101 is part of a unit which includes a gear 102 which is driven from the gear 104 on the pulley unit through an intermediate intermeshing pinion 103. The gear design is such that the spool 85 tends always to be driven faster than necessary to wind up all the thread pulled along by the pulley 83. This keeps the thread taut, while permitting the speed differential to be accommodated by slippage of the spool 85 at the friction disc 101.

According to the arrangement just described, whenever the pressure foot 67 descends to press the fabric item 23 with its underlying section of thermoplastic coated carrier 70 against the heated anvil 63, the horizontal shaft 84 which carries the large vertical pulley 83 turns, but the pawl and ratchet mechanism 93 and 94 prevents the pulley 83 itself from turning, and hence no motion is imparted to the carrier filament. It is during this time that the thermoplastic material is transferred to the thread ends. However, when the pressure foot ascends after the transfer operation is completed the horizontal shaft 84 is turned in the opposite direction. Since the pawl and ratchet mechanism is in operation on this stroke, the friction clutch 90 and 92 imparts motion to the large vertical pulley 83 to bring another length of carrier filament between the pressure foot and the heated anvil ready for operation on the next fabric item.

As previously pointed out, as the trailing end of each fabric item arrives at location A one or another of the thermoplastic depositing heads 39 is presented with its anvil 63 and an unused section of the coated filament 70 beneath the fabric 23 in position to engage three or four of the terminal stitches when the pressure foot descends (FIGURES 1 and 2).

Each thermoplastic depositing head is equipped with a four-way air valve 105 of appropriate type, and adjustable to its various settings by cam action, has a cam follower 106 adapted to cooperate with a metal bar 107 extending in a fore and aft direction and mounted on the top of the upper plate 37. As the depositing head 39 arrives in location A, the cam follower 106 engages the bar 107 which cams the valve 105 to a position in which the top of the air cylinder 68 is connected with an air supply and the bottom exhausted to the atmosphere. This causes the piston in the air cylinder to descend and press the pressure foot onto the fabric, the carrier filament onto the heated anvil and the filament into engagement with the fabric.

The thermoplastic depositing head 39, to effect transfer of the thermoplastic material, remains active until location B is reached, whereupon the cam follower 106 which controls the four-way air valve 105 rides off from the raised metal bar 107 and is allowed to return to its initial position in which air under pressure is supplied to the bottom of the air cylinder 68 and the top of the air cylinder exhausted to the atmosphere. This operation of the valve 105 causes the piston to ascend and the pressure foot to be restored to its uppermost position. During the upward movement of the pressure foot the carrier filament is indexed in the manner previously described to present a new unused piece of carrier filament in operative position and the fabric item continues on its way free from the anvil and pressure foot.

The head moves along the continuous track back to position A where it meets another fabric item, it being understood, of course, that the two intermediate thermoplastic depositing heads will in like manner have performed a similar function with respect to two subsequent fabric items.

Air is supplied to the air cylinders and electricity to the cartridge heaters through appropriate tubing and electrical wiring connected, respectively, with a source of air pressure and source of electrical energy. The tubing and the wiring extend from their sources of air and electrical energy through a rotatable connection 108 mounted on top of a vertical stanchion 109 extending upwardly from the top plate.

FIGURE 3 shows one type of carrier filament which may be used in accordance with this invention. This carrier filament comprises a thread 115 which is uniformly coated with a thermoplastic material 116.

In FIGURE 2 there is shown a preferred positioning of the coated thread 70 with respect to the thread ends 26 and 27 of the sewn seam of the fabric. This figure shows the close proximity of the thermoplastic material to the thread ends when it is removed from the carrier filament and deposited on the sewn seam.

The filament for carrying the thermoplastic material may be in the form of a yarn, thread, ribbon, tape, wire, etc. The carrier should be able to withstand the heat and pressure required to remove the thermoplastic coating and should allow the thermoplastic material to adhere to the carrier so that the coating does not crack or fall off during handling. Satisfactory materials for the carrier are rayon, cotton, glass, aluminum, etc.

The thermoplastic material used will depend to a large extent on the type of thread used in the sewn seam. The main requisite is that the thermoplastic material adhere to the thread ends. Selection of thermoplastic material will also depend on the final use of the product. For instance, if wear resistance is required, the polyamides such as nylon 6 and nylon 66 are preferred, whereas, for softness, the polyolefins such as polyethylene or polypropylene have been found satisfactory. Other suitable thermoplastic materials are the vinyl resins, acrylic resins, etc.

In many instances it will be necessary to cover the heated metal surface with Teflon or similar material to prevent the thermoplastic material from sticking to the hot surface during the operation of the machine.

Thermoplastic material may be applied by the methods and machines of this invention to virtually any material to which it will adhere. Such materials would include wood, woven fabrics, nonwoven fabrics, knitted fabrics, paper, etc.

The heat and pressure necessary to remove the thermoplastic coating from the carrier filament and to adhere it to another material will depend mainly on the type of thermoplastic material used and the time of contact between the thermoplastic material and the object to which it is to adhere. For polyolefin materials a temperature of from about 250° F. to about 500° F. with pressures of from about 25 pounds per square inch to 100 pounds per square inch have been found satisfactory, while for the vinyl compounds temperatures of from about 500° F. to 600° F. with pressures of from about 25 to 100 pounds per square inch have been found satisfactory. The time of contact will depend on the material used and the preferred amount of penetration of the thermoplastic material into the fabric. For vinyl compounds, time of contact between 5 and 10 seconds have been found satisfactory.

Having now described the invention in specific detail, it will be readily apparent to those skilled in the art that innumerable variations, applications, modifications and extensions of the basic principles involved may be made without departing from its spirit and scope. The invention therefore is intended to be limited only in accordance with the appended patent claims.

I claim:

1. A machine for dispensing predetermined amounts of a thermoplastic material and applying the same to sewn seams of objects presented to the machine, which comprises: means to support a spool of carrier filament material coated with thermoplastic material, means to advance said carrier filament material a predetermined length at a time through said machine, an anvil located in the vicinity of said carrier filament material as it advances through the machine, mechanism for exerting pressure on a sewn seam located on said anvil and on said carrier filament material located in the vicinity of the anvil and for releasing said pressure after a predetermined period, means for heating the anvil during the period when said pressure is applied and means for conveying said carrier filament spool, anvil, pressure-exerting mechanism and heating means a predetermined distance at the same speed and at the same time during the period when said heat and said pressure are being applied whereby the thermoplastic material is transferred from the carrier filament material to the sewn seam of the object.

2. A machine for intermittently depositing uniform amounts of thermoplastic material on the thread ends of sewn seams of continuously moving objects, which comprises: means for moving a plurality of objects having sewn seams one after another past a given station, means for positioning successive lengths of a continuous carrier filament coated with solid thermoplastic material adjacent the thread ends of sewn seams of said objects as they arrive at said station, mechanisms operable at said station to apply heat and pressure to each of said carrier filament lengths and to the thread ends of the sewn seams of the object arriving at the station simultaneously therewith, and means for conveying said heat and pressure-applying mechanisms and continuous filament carrier a predetermined distance at the same speed and at the same time while heat and pressure are being applied whereby the thermoplastic material is softened and pressed into adhering relationship with the thread ends of the sewn seams of said objects and means for discon-

tinuing said heat and pressure after a given period to facilitate separation of said objects from said carrier filament.

3. A machine for intermittently applying small amounts of thermoplastic material to the thread ends of sewn seams, which comprises: means for positioning a length of carrier filament coated with thermoplastic material between two surfaces, means for conveying said surfaces with a carrier filament therebetween from a first location to a second location, means for presenting the thread ends of a sewn seam between said surfaces at said first location, mechanisms for urging said surfaces toward each other to apply pressure on said thread ends and said coated carrier filament positioned therebetween, means to effect the transfer of the thermoplastic coating from said carrier filament into adhering relationship with said sewn seam while said thread ends of the sewn seam and said surfaces with the carrier filament therebetween are conveyed to said second location, means for removing the pressure from between said surfaces, means for removing the length of carrier filament from which the thermoplastic coating has been removed from between the surfaces and introducing another length of said carrier filament coated with thermoplastic material in position between said surfaces.

References Cited by the Examiner

UNITED STATES PATENTS

1,776,141	9/30	Bibb et al.	117—112 X
2,078,448	4/37	Jost.	
2,255,953	9/41	Vergobbi	117—112 X
2,328,063	8/43	Dodge.	
2,798,456	7/57	Pearson	118—323 X
2,813,052	11/57	Lancaster	117—3.4 X
2,880,539	4/59	Frenkel et al.	156—541 X
3,039,429	6/62	Mains	118—106 X
3,039,430	6/62	Papp	118—257 X

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