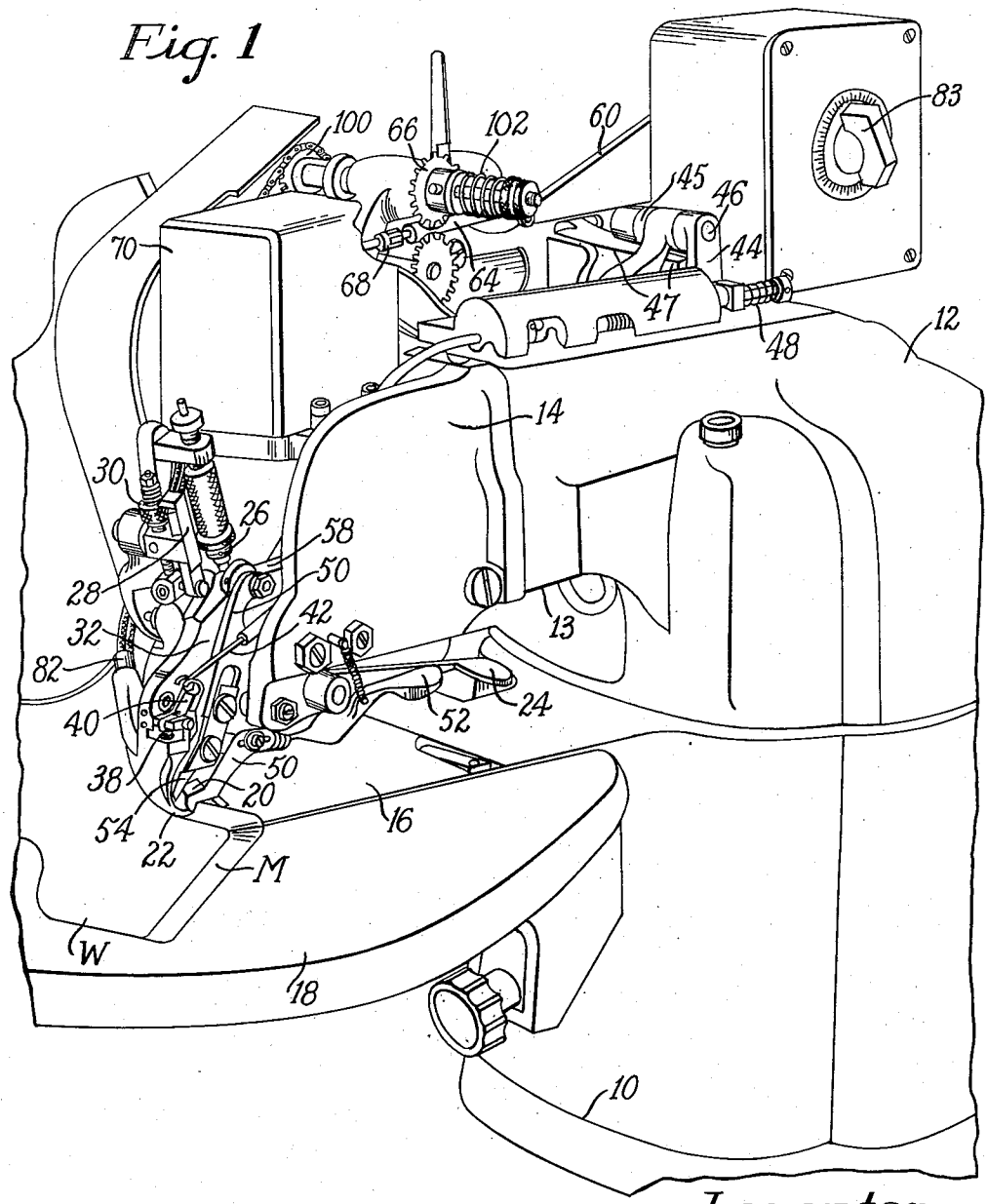
Jan. 24, 1961 H. C. PAULSEN 2,969,056

APPARATUS FOR HANDLING THERMO-RESPONSIVE CEMENTS

Original Filed Nov. 30, 1953 3 Sheets-Sheet 1

Fig. 1



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APPARATUS FOR HANDLING THERMO-RESPONSIVE CEMENTS

Original Filed Nov. 30, 1953 3 Sheets-Sheet 2

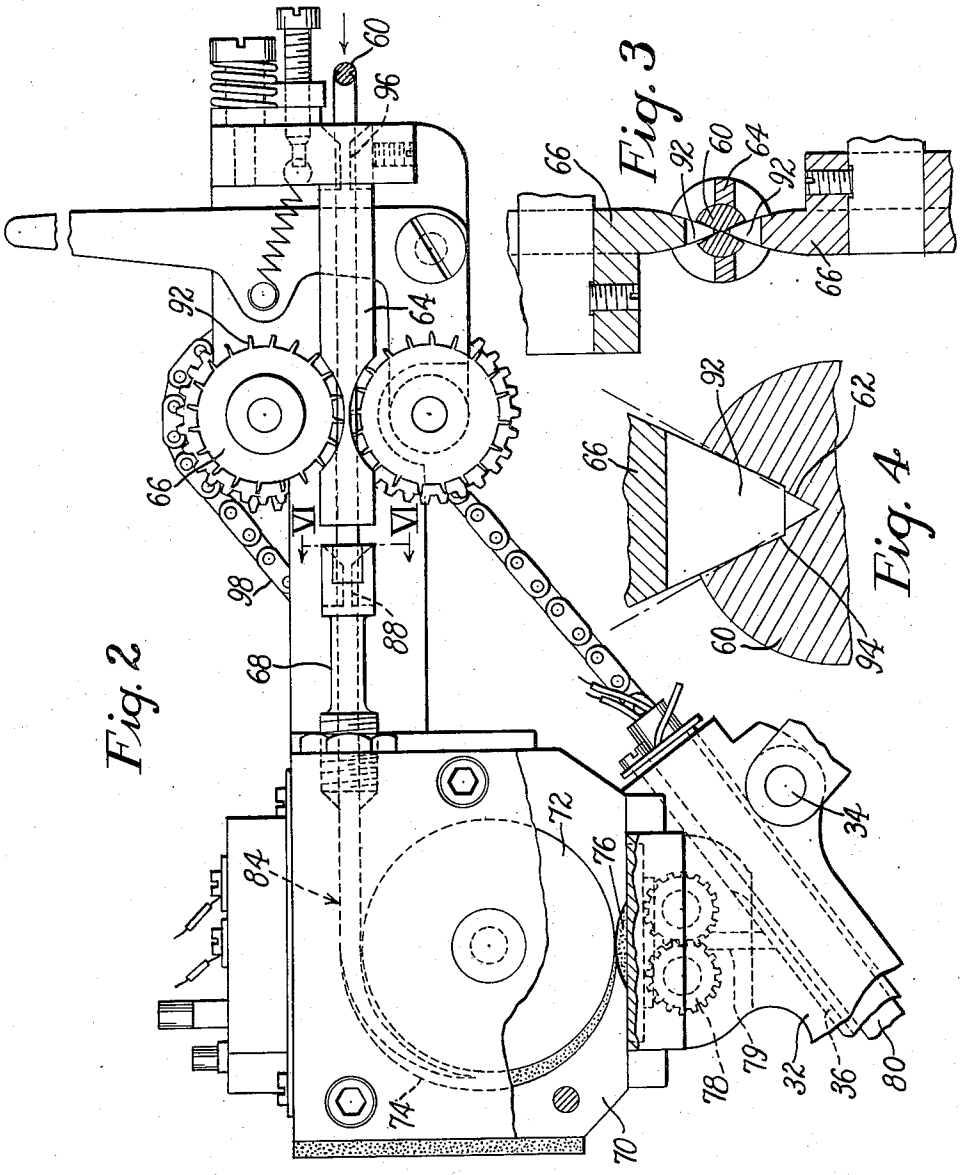


Fig. 2

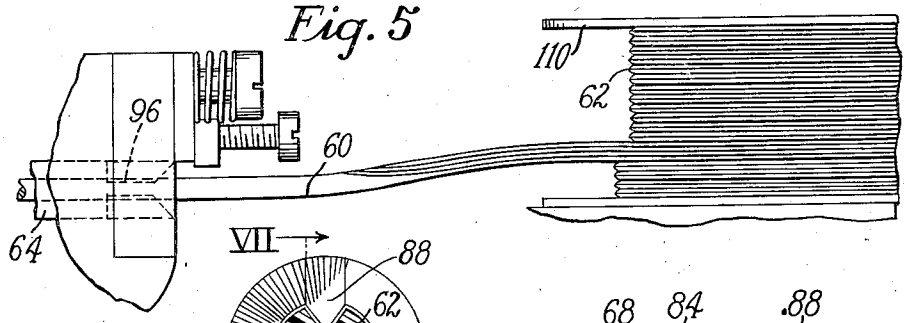
Fig. 3

Fig. 4

APPARATUS FOR HANDLING THERMO-RESPONSIVE CEMENTS

Original Filed Nov. 30, 1953 3 Sheets-Sheet 3

Fig. 5



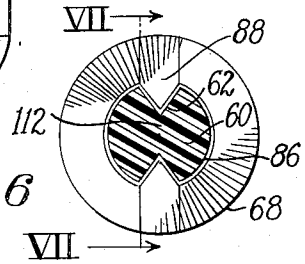


Fig. 6

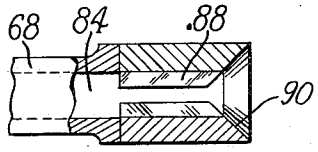


Fig. 7

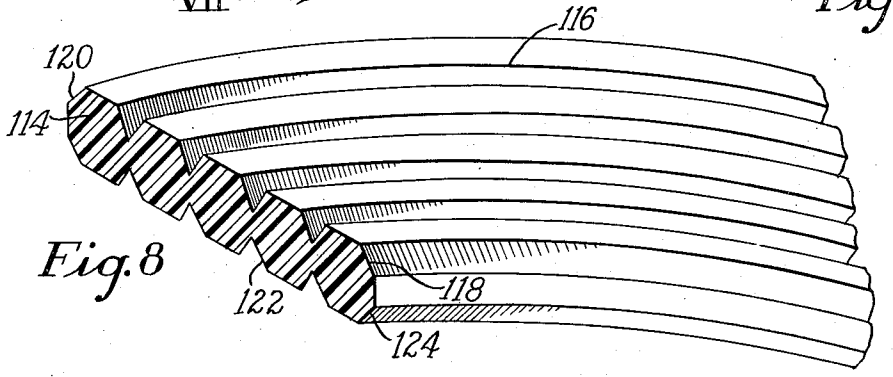


Fig. 8

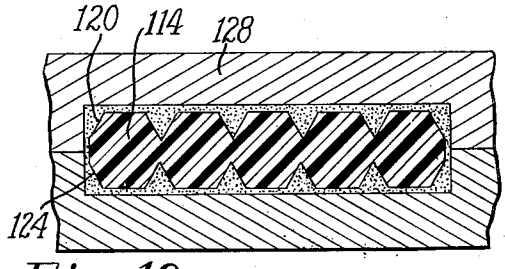


Fig. 10

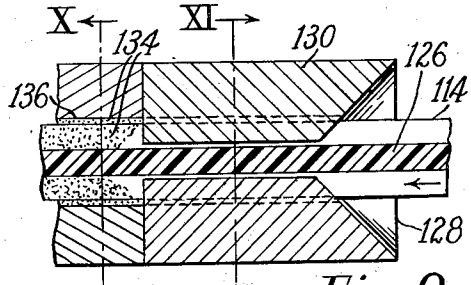


Fig. 9

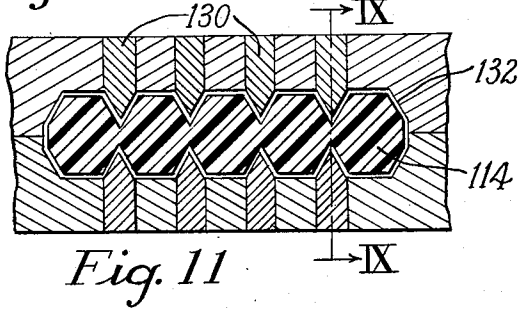


Fig. 11

United States Patent Office 2,969,056 Patented Jan. 24, 1961

2,969,056

APPARATUS FOR HANDLING THERMO-RESPONSIVE CEMENTS

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Original application Nov. 30, 1953, Ser. No. 395,071, now Patent No. 2,874,084, dated Feb. 17, 1959. Divided and this application Dec. 5, 1957, Ser. No. 700,895

6 Claims. (Cl. 126—343.5)

This invention relates to apparatus for handling thermo-responsive cements in rod form of the novel and improved type disclosed and claimed in United States application Serial No. 395,071, filed November 30, 1953, now United States Letters Patent No. 2,874,084, granted February 17, 1959, of which the present application is a division.

As is explained in detail in the aforementioned application, the improved cement rod has a cross-sectional contour such that the ratio of surface area to volume is high thereby facilitating the transfer of heat and the fast melting of the adhesive, while retaining sufficient stiffness to perform control and feeding functions required in a direct through-feed adhesive dispensing system. Thus the improved cement rod may be provided with opposed longitudinally extending V-grooves to facilitate coiling of the rod and also to expose increased surface area for melting, although in some instances a single V-groove may be found to increase the surface area exposed sufficiently.

A principal object of this invention is to provide a novel and improved apparatus which is especially adapted to handle a grooved cement rod of the aforementioned type, thus, in the herein illustrated apparatus, which includes a heated casing provided with a passageway for melting and dispensing a grooved rod of thermoplastic adhesive and a feeding device for feeding a rod of adhesive into the passageway, the passageway comprises an entrance portion which is complementary to the cross section of the rod, an intermediate portion having a cross section similar to that of the rod but bridging the groove, or grooves, in the rod to provide a free space between the walls of the groove, or grooves, of the rod and the wall of the passageway for the reception of molten cement as the material expands, and a discharge portion for delivery of molten adhesive. Preferably, the space thus provided per unit length corresponds approximately to the volumetric expansion of a unit length of the material.

More particularly, in the herein illustrated apparatus a member is rotatable within a recess in the heated casing which has an entrance and an outlet opening and a passage connecting these openings and extending around the rotatable member, this passage being at least as large as the rod adjacent to the entrance opening and then tapering down to the outlet opening, and an entrance gland is provided for the rod projecting from the casing at the entrance opening and having an inwardly projecting rib, or ribs, fitting and entering the groove, or grooves, in the rod. Preferably, and in the herein illustrated apparatus, the feeding device may comprise a driven feed wheel having a tapering periphery adapted to enter into the groove in the cement rod, which is alined therewith by the above-mentioned rib on the entrance gland, and having spaced teeth with squared ends so as to bite into the sides of the grooving on the rod, together with a guide means preceding the feed wheel and having a groove entering projection to orient the rod with the feed wheel.

The above and other features of the invention will appear in the following detailed description of the preferred

embodiment which is illustrated in the accompanying drawings and will be pointed out in the claims.

In the drawings,

Fig. 1 is an angular view of a folding machine embodying a novel mechanism for handling a rod type of cement having a particular physical contour;

Fig. 2 is a side elevation of a feeding and melting mechanism for handling one form of a cement of this type;

Fig. 3 is an enlarged fragmentary section through feed rolls for the rod and the material on the line III—III of Fig. 2;

Fig. 4 is a still further enlarged section through a portion of the rod material, showing one tooth of a feed wheel;

Fig. 5 shows in elevation a coiled rod of the opposed-groove type and the entering portion of a guideway therefor;

Fig. 6 is a section, greatly enlarged, on the line VI—VI of Fig. 2 to show the contour and cross section of the cement together with that of the entrance gland where the rod of material is received in the heating device;

Fig. 7 is a longitudinal section through part of this gland taken on the line VII—VII of Fig. 6;

Fig. 8 shows a modified rod having grooving in the form of a plurality of V-shaped grooves upon opposite sides of a flattened strip;

Fig. 9 is a longitudinal vertical section through a portion of an entrance gland showing two of the splines fitting the grooves and this section is taken on line IX—IX of Fig. 11;

Fig. 10 is a vertical section on the line X—X of Fig. 9 showing the rod in the entrance gland after it has passed the splines; and

Fig. 11 is a similar section taken through the splined portion of the entrance gland on the line XI—XI of Fig. 9.

Although cement derived from a melted rod, such as that which forms the subject-matter of the invention, may be applied to pieces of work by machines of radically different construction and purpose, it is found convenient to illustrate herein a machine for folding the margins of work pieces such as leather shoe-upper parts in which the novel rod may be employed. This machine is of the type illustrated in my prior application mentioned above. It comprises a base **10** on which there is mounted a top **12** having an overhanging arm **13** which supports an end cap **14**. A lower arm **16** of the machine is provided with a work table **18** on which is supported a piece of work W, such as a pair of shoe quarters joined at the back seam and provided with a skived margin M.

The folding of this margin is carried out in the usual fashion by means of a folding finger **20** which cooperates with a creaser foot **22**. The creaser foot and a number of other parts of the machine which overlie the work are mounted in the head **14** and, as was true in the machine of my prior application, the creaser foot is tiltable, to facilitate the admission of a piece of work, by means of a finger piece **24**. It is held yieldably against the work by a spring inside of a sleeve **26** and the limit of downward movement of the creaser foot is controlled by a dovetail slide **28** which is pivotally attached thereto and which has an overhanging top end engaging an adjustable graduated finger piece **30**. A carrier arm **32** to which the creaser foot is attached is mounted on a pivot **34** (Fig. 2) within the head of the machine and is provided with a cement passage **36** terminating in an outlet opening (not shown) at the lower end of the creaser foot **22**. Adjacent to the outlet there is a movable valve closing the outlet and having a stem **38** which is joined to a bell crank **40**. The bell crank is adapted to be rotated to open the outlet by a Bowden cable **42** extending to a point on the top of the arm **12** where it is pulled to the right by a two-arm lever **44, 45** mounted

on a spindle 46 arranged to be turned in a counterclockwise direction, as is viewed in Fig. 1, by a solenoid (not shown) pulling down the far end of a lever 47 and raising its near end beneath the arm 45. This solenoid is energized when an operator-controlled switch is closed every time the operator presents a new piece of work to the machine. A spring 48 provides a yielding connection between the lever 44 and the Bowden cable 42, thereby avoiding breakage in case the valve spindle 38 is stuck because the operator has not applied heat for a sufficient length of time before starting the machine.

The end cap 14 also provides a support for a gage finger 50 having a finger lever 52, as well as for a snipping knife 54 attached to a pivoted lever 56 which may be oscillated by power supplied to a rod 58, as is common in machines of this type.

A rod 60 of thermoplastic cement has a special cross-sectional contour the purpose of which will appear during the further discussion of the handling mechanism. In the particular form illustrated in Figs. 2, 3 and 4, it is provided with opposed re-entrant grooves 62 the walls of which diverge at an angle of approximately 60°. It will be noted that the apices of the opposed grooves are separated (Fig. 3) by a sufficient distance to leave a central core having ample strength to permit the handling and feeding of the rod material.

In the illustrated machine, the rod is supplied to the handling mechanism of Fig. 2 from a reel 110 (Fig. 5) and passes from that reel to a guide tube 64 cut away to permit the engagement of the rod with coacting feed wheels 66 which pass the rod along through an entrance gland 68 to a heated casing 70. A space is provided between the guide tube 64 and the gland 68 so that heat is not transferred by conduction from the latter to the guide tube.

In this casing 70, there is a driven disk 72 partly surrounded by a passage 74 extending from the entrance gland 68 to an outlet 76 where the melted cement is received by a pump 78 and forced through a pump outlet 79 and thence through the passage 36 in the carrier 32 for the creaser foot 22. Within the passage 36 there is a heating unit 80 to maintain the molten condition and other heating units (not shown) are provided for heating the casing 70 and hence the disk 72, as well as a unit 82 (Fig. 1) attached to the side of the creaser foot 22. A control rheostat 83 is connected to the unit 82 to control the heat in the creaser foot.

An initial portion 84 of the passage 74 is cylindrical and is slightly larger than the diameter of the cold rod so as to permit the free running of the rod through this portion as it expands in volume. On the other hand, the passage 74, from a point at the top of the disk to a point at the bottom thereof adjacent to the outlet opening 76, is rectangular and is gradually tapered and extends around the periphery of the disk so that the latter is in contact with the cement along about half of its periphery. This disk, as explained in my prior application, is of major assistance in delivering sufficient heat to melt the material since it picks up heat from the casing as any point on its periphery rises and gives it up to the cement as that point rubs against the cement. The disk also actively assists in frictionally carrying the material along through the passage as the material gradually melts.

Due to the tapering portion of the passage 74, which is made as wide as is the disk and is normally rectangular in cross section, and partly because machines of this type are intermittently operated, there is created a back pressure which is particularly noticeable during periods between the times of delivery of cement to successive pieces of work. During the times when the machine is temporarily shut down, there is a tendency for the back pressure within the casing 70 to cause the molten cement to ooze out around the rod at the entrance of the casing and to form a doughnut-like blob at the outer end of the gland 68. Under certain conditions, this blob of material may remelt and be drawn into the gland by the ingoing rod, but, in general, it will grow larger and need to be removed. On the other hand, the passage for the introduction of cold cement may not be made to fit too tightly against it because of the need for easy entrance of the rod during the operation of the machine and because of the necessity for providing for the expansion of the material as it is heating. In practice, the apparently large space 86 (Fig. 6) around the rod in the entrance gland 68 is not appreciable and for the 3/16" rod is a space of 1/64". Furthermore, any passage of the molten cement back along the grooves 62 is substantially prevented by the provision of tapered splines 88 (Figs. 2, 6 and 7) which enter and substantially fit said grooves. It will be noted that the entrance end 90 of the gland 68 is counterbored and the ends of the splines are cut away at the same angle to facilitate the entrance of a fresh piece of cement.

The entrance gland 68 is provided with thin walls and extends out from the casing 70 a substantial distance so that it will be air cooled and prevent the heat of the casing from being conducted far enough along the tube to cause the rod to stick to it when the machine is started up after an interval of disuse.

In the feeding of the rod, the cooperating feed wheels 66, the periphery of each of which is tapered as shown in Fig. 3, wedge themselves into the groove to an extent which prevents any slipping of the feed wheels on the rod. Preferably, and as illustrated in Fig. 4, the taper of the peripheries of the feed wheels is slightly less than that of the grooves in the rod and the teeth 92 thereon are decapitated or squared to prevent them from bottoming in the groove. As a result the corners of the teeth cut into the sides of the grooves as indicated in Fig. 4 at 94 and obtain a positive bite. At the entrance of the guide tube 64 are splines 96 which are shaped similarly to the splines 88 in the gland 68. They are, however, for an entirely different purpose and serve to aline the grooves of the rod with the peripheries of the feed wheels as the rod comes to the handling apparatus from a storage reel 110 (Fig. 5) or the like.

The pump 78 is power driven as in the earlier machine and a chain 98 and a cooperating sprocket 100 (Fig. 1) are used to drive the feed wheels 66. A slip clutch or impositive drive is provided, as in the earlier machine, to avoid any breakage of parts in case the operator tries to start the machine before the cement is melted.

The rod of cement, which forms the subject-matter of the invention claimed in the parent application referred to above, is composed of thermoresponsive cement of solid volatile-solvent-free materials made into an elongated body which has, throughout its length, substantially the same gross cross section (as defined by a perimeter bridging the groove). Such rods are usually thermoplastic materials which are solid at room temperatures but which may be melted for application to the work, usually by the use of rather high temperatures such as 300° F. or higher. Conveniently, such a rod 60 may be formed into a coil or the like, mounted upon a suitable reel 110 (Fig. 5) and the coiling is facilitated by the provision of the opposed re-entrant grooves 62 because of the added flexibility imparted to the rod. At the same time there is enough separation at 112 (Fig. 6) between the bottoms of the grooves so that there is ample strength to permit the handling and feeding of the rod. When used in folding machines the quantity desired for application to the work may be readily provided by a rod having a diameter of 3/16" and such a rod is shown at about twice its normal size in Fig. 3 and about twelve times its normal size in Fig. 6. In the handling apparatus the grooves 62 are filled by the entering splines 88 forming a part of the entrance gland 68. The rod is guided to the entrance tube in proper position by reason of the additional splines 96, supported by the guide tube 64, prior to their passage through the feed rolls 66.

After the rod has passed the splines **88** of the entrance gland of the heated casing **70**, it is received in a space **84** (Fig. 2) which is as large as or slightly larger than the largest diameter of an ungrooved rod of the same size. There, the rod greatly facilitates the proper operation of the heating device because the grooving furnishes a space into which the expanded and melted cement may flow, and provides a high ratio of surface area to volume, per unit of length. By reason of the fact that the volume per unit length of these two grooves corresponds approximately to the volumetric expansion per unit length of the rod material when melted, the expanded and melted cement will be received by the grooving and this action will, to a large extent, overcome the tendency for it to work out of the entrance opening by reason of back pressure.

Furthermore, the adhesion between the melted cement and the sides of the grooves in the rod is much greater than the adhesion between the cement and the opposed subtended or underlying portions of the walls of the passage **84** partly because the area of said sides of the groove is nearly twice as great as that of the wall section in question, which also, by reason of the fact that it is hotter than the rod, tends to melt any adjacent portions and make them "slippery." Probably, too, the angular groove drags the cement away from the entrance, providing fresh space for expansion. The grooved rod also gives added help in pushing along the molten cement so as to keep it moving toward the outlet and prevent any one portion from being exposed for any considerable period to the temperature of the heated casing. Those portions of the surface of passage **84** which lie opposite to the grooves may also be considered to correspond to the removed periphery of the rod which follows the formation of the groove.

It will be understood that although the grooved contour or cross sectional shape of the rod which is illustrated in Figs. 5 and 6 constitutes a simple and convenient arrangement, it is not the only contour which would accomplish substantially the same result and which may be desired under other conditions. For example, for the formation shown in Fig. 8, a rod **114** is flatter than that shown in Fig. 6 and is provided with grooving illustrated as comprising four V-shaped grooves **116** formed upon the upper surface together with a cutaway grooving **118** and **120** at the corners, while the bottom surface is similarly provided with inverted V-shaped grooves **122** and cutaway corners **124**. The core **126** between the apices of the grooves furnishes strength enough for easy handling of the rod, while not interfering with the easy coiling of the rod or with the penetration of heat. I have found, for example, that it is not desirable to have any point in the rod more than ¼" from the nearest outside surface and that the minimum total thickness of the rod should be ⅛". In the handling of such a rod, feed wheels will enter the grooving and may be multiple wheels of the type shown in Fig. 3. An entrance gland **128** may be made up of two halves each of which is provided with a series of splines **130** which fit the grooves of the top and bottom surfaces of the rod. These opposed grooves at the entrance end of the gland are also provided with surfaces **132** (Fig. 11) which coact with the corner grooves **118**, **120** and **124** so that there is very little possibility of leakage when the molten cement **134**, in the inner portion **136** of the entrance gland shown in Fig. 10, fills the grooving. The dimensions of the grooving are such, as in the other form of rod, that the volumetric expansion per unit length of the rod is substantially equal to the volume per unit length of the grooving. The action of the grooves in dragging along molten cement will be the same with this form as with the form shown in Fig. 6 since the area of the sides of the grooves will be substantially twice as great as the area of the subtending portions of the inner surface of the entrance gland.

In the operation of the machine, assuming that a coiled supply has been positioned thereon and the rod **60** has been fed into the guide tube **64**, being oriented therein by the guide splines **96**, and thence to the entrance gland **68**, the heat will be turned on and the cement, if any, already in the machine will be thoroughly melted. The operator will then, by means of a suitable knee lever or treadle or the like, start the drive of the folding machine and the oscillatory drive for the handling apparatus. After this, the cementing of the margin M of a work piece W and the immediate folding thereof will take place in the usual fashion.

A minimum quantity of material is heated at any time and only so much cement is delivered to the creaser foot **22** as is needed by the work. This quantity will always be maintained at the desired temperature so that it will flow freely from the outlet of the creaser foot nozzle. The difficulties which have been previously found in the handling and melting apparatus will have been substantially overcome by reason of the special formation of the rod **60** and the arrangement of the cooperating parts of the handling apparatus. With the rod **114**, the action will be substantially the same.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination, heated means providing a passageway for an elongated rod of indefinite length of thermoplastic adhesive, disposed in cooperative relationship with said passageway, for melting and dispensing said adhesive as said rod is moved through said passageway, said rod having a substantially uniform gross cross section throughout its length and having a longitudinally extending groove, and said passageway comprising an entrance portion complementary to the cross section of said rod, an intermediate portion having a cross section similar to that of the rod but bridging the groove, and a discharge portion for delivery of molten adhesive.

2. In combination, means providing a heated passageway for cooperation with a grooved elongated rod of thermoplastic adhesive, of indefinite length and uniform cross section, for melting and dispensing said adhesive, and a feeding device for feeding said rod into said passageway, said passageway comprising an entrance portion complementary to the cross section of said rod, an intermediate portion having a cross section similar to that of the rod but bridging the groove of the rod, thereby providing a free space between the walls of the groove of a rod and the wall of the passageway, and a discharge portion for delivery of molten adhesive.

3. In a machine for use with a rod of thermoresponsive, solid, cementitious material having a re-entrant groove extending lengthwise thereof, handling apparatus for the rod comprising a feeding device for moving the rod lengthwise, a guide for the rod preceding said feeding device provided with an inwardly directed member entering said groove thereby to orient the rod as it is delivered to the feeding apparatus, a heated casing having a transverse passage connecting an entrance and an outlet opening therein, and control means at the entrance opening, including an inwardly projecting rib substantially fitting the groove in the rod as the latter enters the casing.

4. In a machine for use with a rod of thermoresponsive, solid, cementitious material, having a re-entrant groove, a heated casing having a recess, a cylindrical member rotatable in said recess, at least a portion of said member contacting said casing to receive heat therefrom, the casing having entrance and outlet openings and being provided with a through passage around said member connecting said openings, said passage adjacent to the entrance opening being at least as large as the rod and then tapering down to the outlet opening as it follows the periphery of said cylindrical member, and an entrance gland for the rod projecting from the casing at said entrance

opening, said gland having an inwardly projecting rib fitting and entering said groove in the rod.

5. A handling apparatus for an elongated rod of thermoresponsive cementitious material having a continuous groove extending lengthwise thereof and capable of being melted by the application of heat, said apparatus comprising a heat applying casing having an entrance and exit, said casing having at its entrance an inlet gland shaped closely to fit said rod and provided with an inwardly directed projection substantially filling said groove, said casing having a passageway, extending from the entrance to the outlet thereof, which, adjacent to the gland, substantially fits the outside of the rod while bridging the groove.

6. An apparatus for handling an elongated piece of flexible, thermoresponsive cementitious material having a continuous groove extending lengthwise thereof, said apparatus comprising a reel for storing said elongated piece of material, a heat applying casing formed to provide a passageway therein and an inlet opening leading into said passageway, a driven feed wheel adjacent to said casing having its periphery tapered to enter and engage the sides of the groove of said elongated piece of material for withdrawing the piece of material from said reel and for feeding the leading end of said piece of material into the inlet opening of said casing, and a guide preceding said feed wheel and located closely adjacent thereto having an inward groove entering projection to aline the groove in the piece of material with the periphery of said feed wheel.

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