Dec. 13, 1955 H. C. PAULSEN 2,726,629

MECHANISMS FOR APPLYING ROD CEMENT

Original Filed Jan. 7, 1953 4 Sheets-Sheet 1

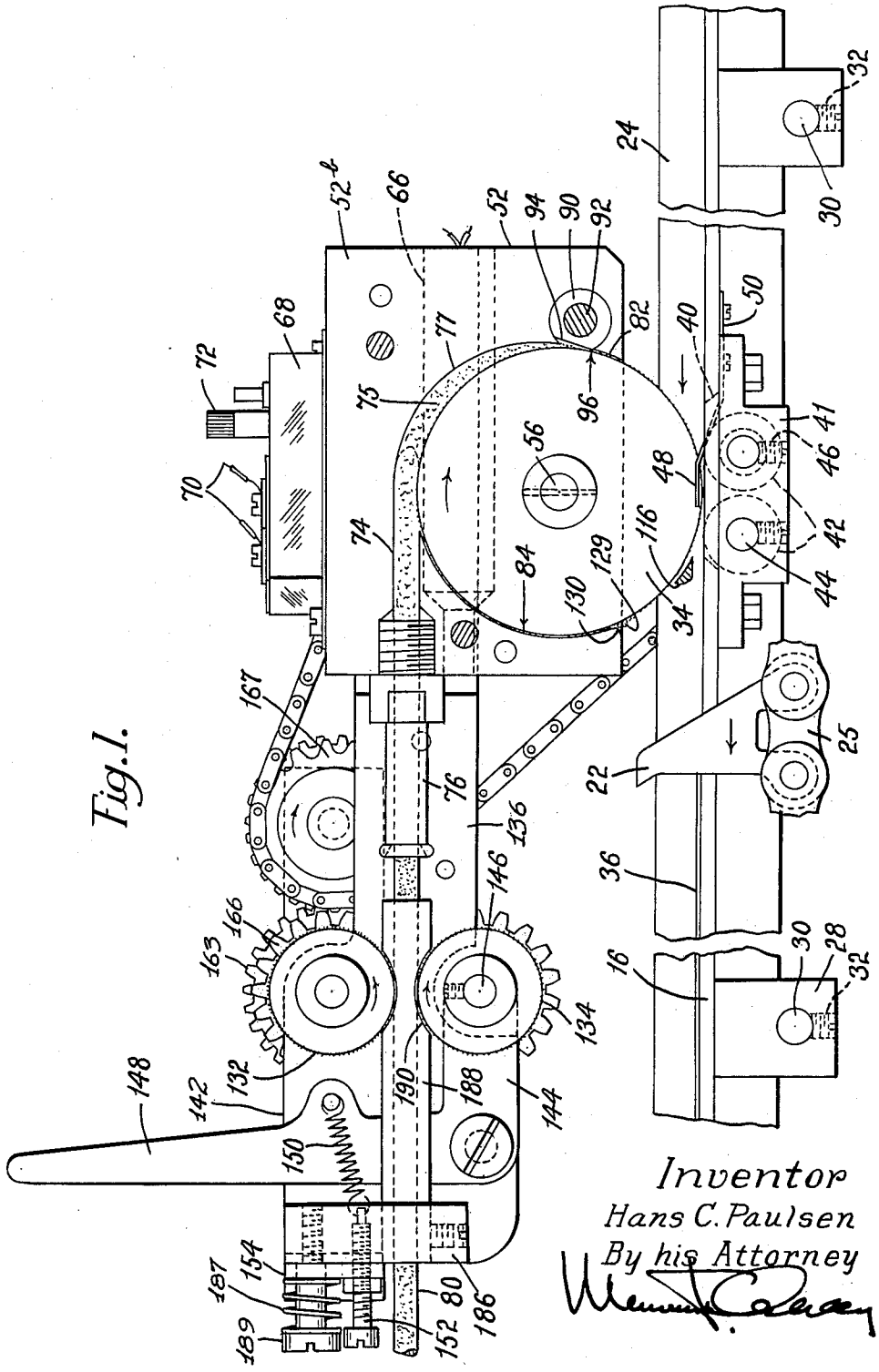


Fig. 1.

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MECHANISMS FOR APPLYING ROD CEMENT

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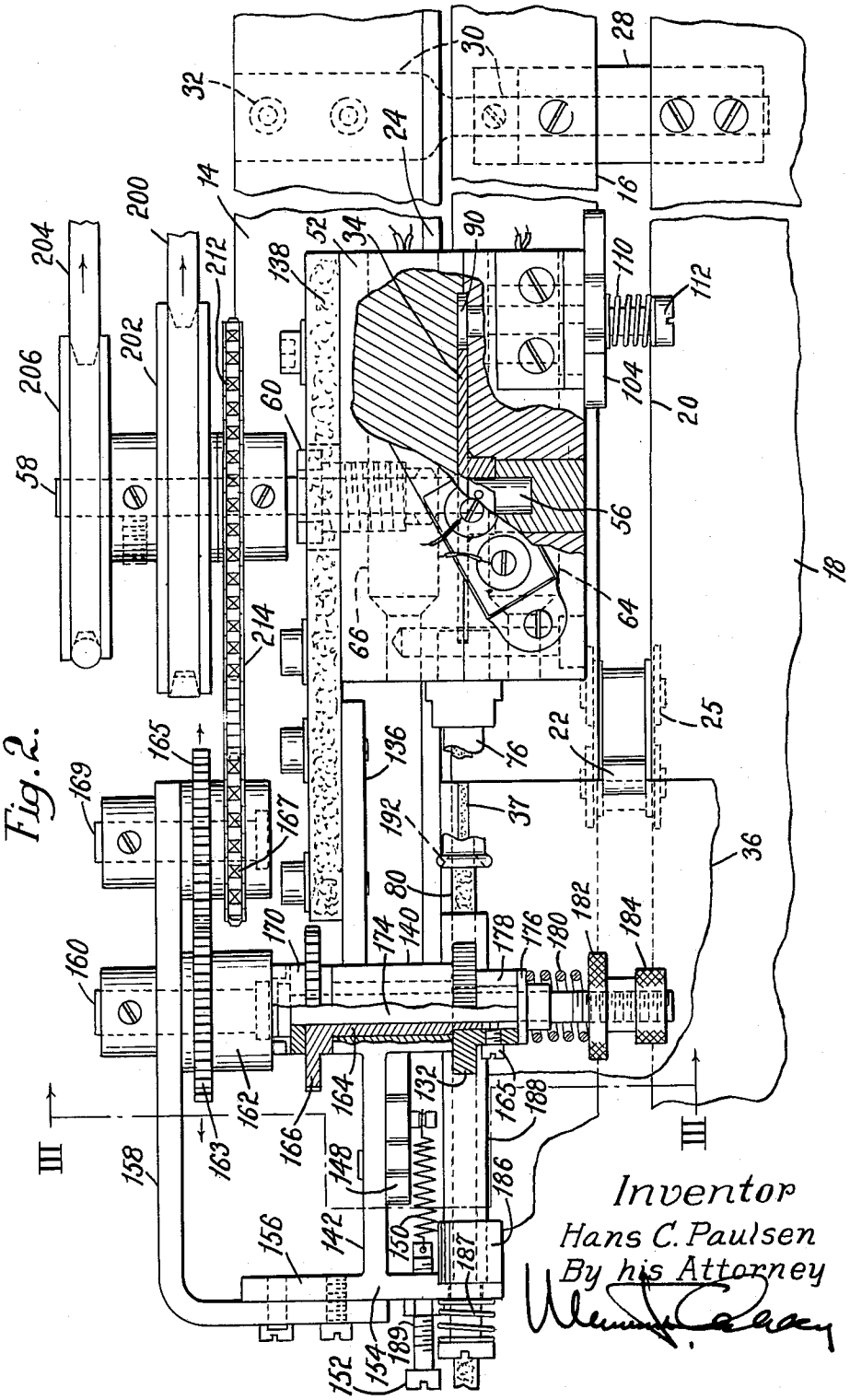


Fig. 2.

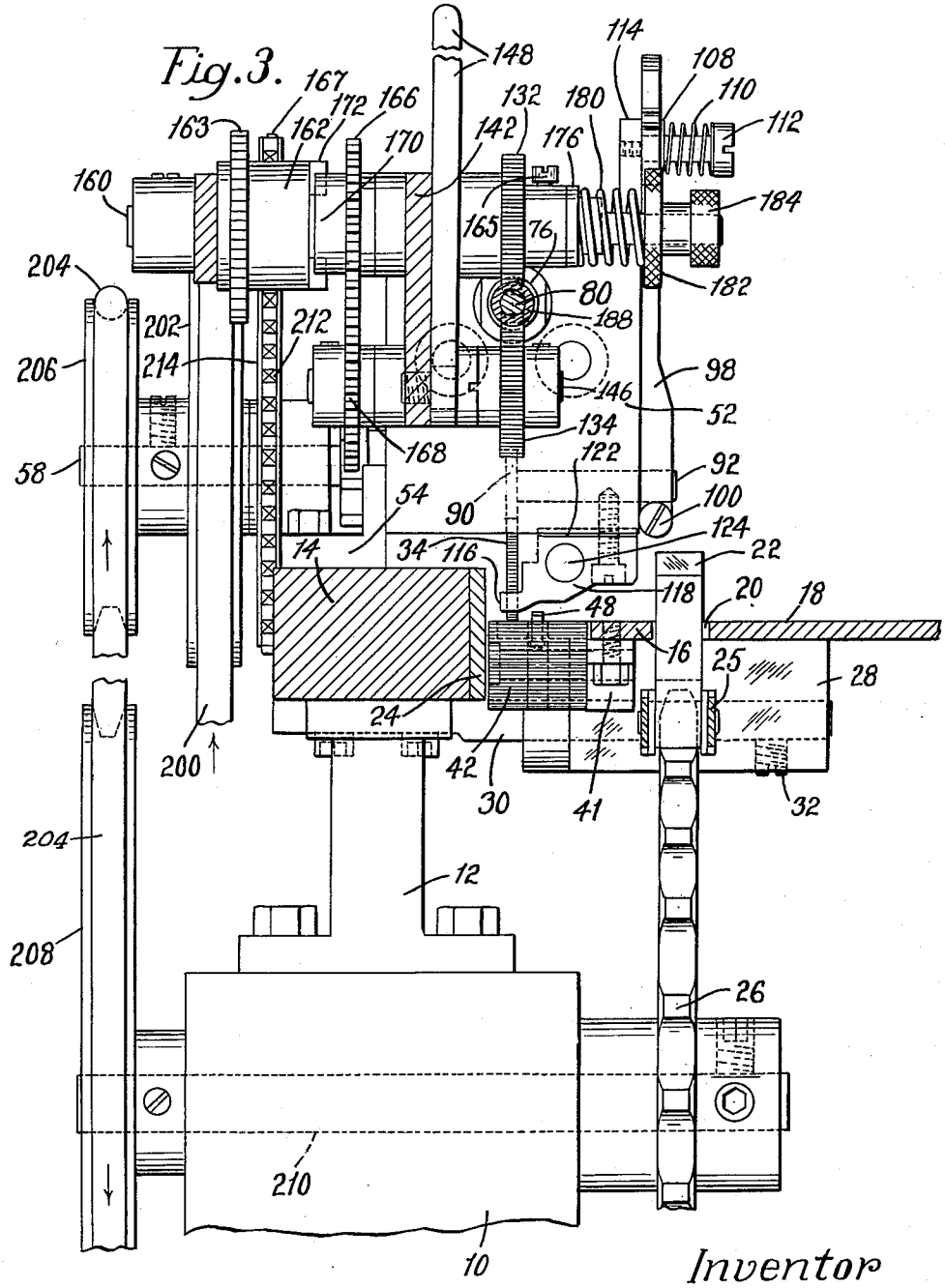
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MECHANISMS FOR APPLYING ROD CEMENT

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Fig. 3.



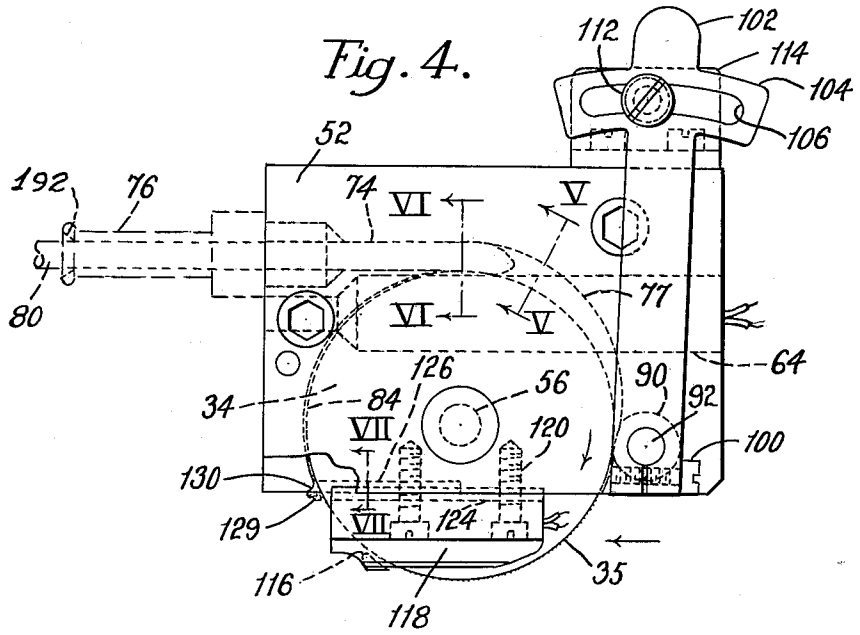
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MECHANISMS FOR APPLYING ROD CEMENT

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Fig. 4.



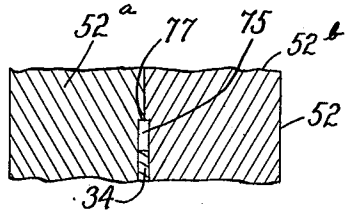


Fig. 5.

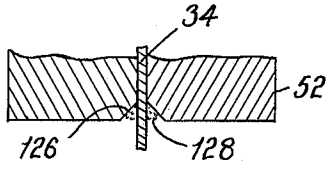


Fig. 7.

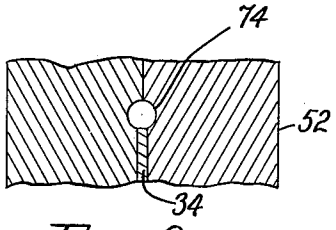


Fig. 6.

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United States Patent Office 2,726,629 Patented Dec. 13, 1955

2,726,629

MECHANISMS FOR APPLYING ROD CEMENT

Hans C. Paulsen, Medford, Mass., assignor to B. B. Chemical Co., Boston, Mass., a corporation of Massachusetts

Continuation of application Serial No. 330,138, January 7, 1953. This application August 12, 1955, Serial No. 527,916

10 Claims. (Cl. 118—202)

This invention relates to a novel and improved mechanism for applying thermoplastic cement supplied in the form of an elongated rod of solid but flexible material and applying it in the form of a stripe to a piece of work. The novel mechanism is herein illustrated, by way of an example, as applied to a machine for tipping book parts, when it is desired to secure a liner to a signature which is to be one of the component parts of a book, but it will be understood that the several features of the invention are not limited to use in a machine of that particular type or to embodiment in the exact mechanical constructions shown. This application is a continuation of applicant's prior application Serial No. 330,138, filed January 7, 1953, and now abandoned.

Thermoplastic cements are found to be very useful for securing together two pieces of work when they can be applied to the work in hot, melted form and the work immediately attached to an adjacent piece before the cement has time to harden. Some of the difficulties of handling such cements have been presented in the copending application Serial No. 329,810, filed January 6, 1953, in my name, for improvements in Cement Handling Apparatus. One of these difficulties lies in the inability to melt the solid cement at a rate fast enough to supply the work without employing a receptacle in which a substantial quantity of cement is stored while it is being heated. To avoid this problem, there is set forth in the last-mentioned application an arrangement in which the rod of cement is fed into a hollow casing which is heated and which contains a driven disk for additionally supplying heat to the cement. In another part of the casing the liquid cement is removed, as by means of a gear pump, and delivered to the work through any suitable conducting device, such as a nozzle. That arrangement is particularly advantageous when the pieces of work are to be presented intermittently. However, in the present application there is described an arrangement utilizing some of the same principles but which is better adapted for the application of a stripe of adhesive to pieces of work which are to be presented at a quite regular rate.

Accordingly, an object of the invention is to devise an improved rod cement applying mechanism and one in which the same disk which is employed for supplying additional heat to the thermoplastic material projects beyond the hollow heated casing in which it is mounted and is utilized directly as an applying member.

With an arrangement of this type, wherein a gear pump is not employed for metering the quantity of cement applied to the work, an important feature of the invention lies in a metering device, in the form of a scraper, readily controlled from the outside of the casing without causing any leakage due to back pressure in the casing. As herein illustrated, this controlling device is in the form of a rotatably mounted doctor which is provided with a flat side adjacent to the disk and which has an arm on the outside of the casing for turning the doctor to vary the relation of the flat side thereof to the disk.

Another feature of the invention relates to a string severing device, preferably heated to a higher temperature than the disk and positioned close to the disk at a point where the latter is leaving the work and returning to the casing.

These and other features of the invention will best be understood from a consideration of the following specification taken in connection with the accompanying drawings, in which

Fig. 1 is a side elevation of the principal part of the cement-handling mechanism and having one side of the casing removed to disclose the internal construction thereof;

Fig. 2 is a plan view, partly in section, of the same mechanism and it shows also a work conveying device and the construction of the drive for the rolls employed to feed a strip or rod of cement;

Fig. 3 is a vertical section, taken on line III—III of Fig. 2, showing the rod-handling mechanism supported upon a portion of a book-tipping machine;

Fig. 4 is a detail showing in side elevation the relation of the doctor and of the string severing device to the cement applying disk; and

Figs. 5, 6 and 7 are detail sections taken on the lines V—V, VI—VI and VII—VII of Fig. 4.

As was noted above, one particular application of the cement handling mechanism is to a book tipping machine by means of which end signatures to be used in making up a book are carried one after another past the cement applying disk and then, by mechanism not herein shown or described, are associated with liners such as are frequently interposed between the book and the cover thereof. There has been included in the drawings, however, a diagrammatic showing of a mechanism for presenting signatures one after another to the cement applying disk, and it will be seen from Fig. 3 that such an arrangement includes a base **10** having one or more columns **12** for supporting a stringer **14**. Attached to this stringer are an inner table **16** and an outer table **18** spaced by a gap or slot **20** along which travel upstanding pawls **22** for pushing the signatures along the table with their back edges in contact with a gage plate **24**. There are a series of such pawls **22** which are attached to the elements of an endless chain **25** carried by two sprockets such as the one shown at **26** in Fig. 3. The two parts of the tables **16** and **18** are supported in any suitable fashion, as by securing them to a pair of blocks **28** which are beyond the ends of the chain and which are adjustably mounted upon outstanding arms **30** having flattened inner ends which are attached to the underside of the stringer **14** as by screws **32** (Fig. 3). Above this table and lying in a plane parallel with the gage plate **24** is an applying disk **34** by means of the exposed portion **35** (Fig. 4) of which a stripe of melted cement **37** (Fig. 2) is applied by rolling contact with the marginal portions of pieces of work such as that indicated at **36**. These pieces are slid along the table by the upstanding pawls **22** and are carried under the disk **34** at a speed equal to the peripheral speed of the disk.

At a position immediately below the applying disk the table is provided with a gap **40** (Fig. 1), beneath which there is mounted in a block **41**, just before and just after the contact point of the disk **34**, a pair of grooved rolls **42**, these being rotatable upon pins **44** which are held in the block by setscrews **46**.

Projecting above the level of the table is the work engaging end **48** of a very light spring finger secured at its opposite end **50** to the underside of the table. This finger lying above the grooves of the rolls **42** has been found to facilitate the proper presentation of the pieces of work to the applying roll. It will be understood, however, that the supporting rolls, and the spring finger

having an end 48, are employed in commercial book-tipping machines and are not a part of my invention.

An important part of my invention is a metal hollow casing 52 which is supported upon the stringer 14 by means of brackets 54 (Fig. 3) and within the hollow part of this casing there is mounted the applying disk 34 which is rotatable with a transverse shaft 56 having an extension 58 (Fig. 2) which passes through a stuffing box 60. Located in the casing upon opposite sides of the disk are cartridge heating units 64, 66 to which current is supplied through a thermostatically controlled switch 68 (Fig. 1) by means of the leads 70. The setting of the thermostat may be adjusted by a finger screw 72. It will be noted in Figs. 5, 6 and 7 that the disk 34 fits snugly in recesses formed in the opposite halves 52*a*, 52*b* of the casing so that the heat of the casing is delivered by conduction to the rotating disk.

The casing is provided with a tangential passage 74 connecting with an inlet tube 76 through which there is fed a rod 80 of thermoplastic cement. The exact cross-section of this rod is unimportant but it is here shown as cylindrical and as substantially fitting the tangential passage 74. At the right of a vertical line through the axis of the disk the passage gradually is constricted until at the section V—V, as shown in Fig. 5, the passage portion 75 is equal in width to the thickness of a disk and the roof 77 of the passage, as it approaches a horizontal line through the axis lies radially closer to the disk so that at the point 82 (Fig. 1) where the disk emerges from the casing the periphery of the disk is spaced from the casing approximately .020 of an inch. Similarly the spacing at 84 around the upgoing side of the disk is approximately .020 of an inch and thus is close enough to absorb heat from the casing through the periphery as well as the sides of the disk to reheat it sector by sector after it has been exposed to the air and has delivered its load of cement to the work. This tube 76 necessarily absorbs heat from the casing 52 but since it is exposed to the air it will be kept at a temperature of approximately 100° F. or less than the temperature of the casing. As a result the tube is warm enough so that the rod slides readily but it is not so hot that there will be excessive melting of the rod at the entrance or any tendency to melt too fast and be pushed out because of an excessive pressure of the incoming rod. The temperature of this inlet tube will be temporarily lowered somewhat by the incoming cool rod but without adverse effect on the operation of the machine.

It will be understood that the action of the disk is threefold. It absorbs heat from the casing along its upgoing side and delivers it to the incoming rod of cement to help melt it. Second, it is effective frictionally to drag along the rod of cement, at least when the latter is cool, and to agitate and stir up the melted cement, and third, it serves as an applying member. In addition, it should be noted, as shown in Fig. 3, that the periphery of the disk is provided with transverse grooves about .005 of an inch deep so that it cooperates with other parts of the device to grind up small foreign particles in the cement just before it emerges from the casing. There it applies the cement to the work by rolling action because of the fact that its peripheral speed is the same as the speed of movement of the pawls 22 as they feed the work along the table. The disk is driven at a speed faster than the normal rate of passage of the cement through the casing. Added speed will increase the friction between the two and hence the heat delivered to the cement. Also it will increase the tendency of the disk to push the cement along toward the outlet. The disk may, if desired, be driven fast enough to supply all the heat needed.

To meter the quantity of cement which is applied to the work and hence to control the thickness of the stripe laid thereon, a doctor 90 (Fig. 1), secured to a transverse shaft 92, is provided with a slabbed-off flat side 94 so that the lower corner 96 of this slabbed-off portion, when brought closer to or farther away from the periphery of the disk, controls the quantity of cement taken out by the latter and applied to the work. A common adjustment of the disk is such that the corner 96 is spaced approximately .005 of an inch from the periphery of the disk. It will be seen from Fig. 3 that the shaft 92, upon which the doctor 90 is mounted, projects beyond the face of the casing and is provided with a control handle 98 which is clamped to the shaft by a pinch screw 100 and which projects upwardly to provide a handle 102 (Fig. 4) by means of which the position of the doctor 90 may readily be adjusted. It will be noted that the handle has an enlarged portion 104 in which there is an arcuate slot 106 and the handle is frictionaly held in adjusted position by a washer 108 (Fig. 3) yieldably held against the face of the handle 102 by means of a spring 110 surrounding the shank of a screw 112 which is threaded in an angle iron bracket 114 attached to the top of the casing 52. With this sort of a doctor, cement under pressure will not pass the doctor and leak along the shaft 92 to which it is attached.

Some difficulty has been experienced because of the tendency of the sticky cement to form strings between the work and the upgoing portion of the disk 34. This difficulty has been overcome, however, by means of a string severing finger 116 which projects across the face of the disk just as it rises from the work and which is preferably heated to a temperature considerably above that of the disk. To this end, the finger is an integral projection of a block 118 attached to the bottom of the casing by means of screws 120 but insulated therefrom by means of an interposed sheet of insulating material 122. Heat to the required degree is supplied to this finger carrying block 118 by means of an electric unit 124. Further to protect the work from any dripping of surplus cement from the side faces of the disk 34, the bottom portion of the casing adjacent to the recess therein is cut back at 126 so that any accumulation of cement at 128 (Fig. 7) or at 129 (Fig. 4) is drawn frictionally back into the casing by the action of the moving disk. To facilitate this latter action, the edge of the recess of the casing is rounded at 130 (Fig. 4) to provide a slightly greater spacing at this point.

Delivery of the rod material 80 to the casing 52 is effected by coacting corrugated feed rolls 132 and 134 driven in opposite directions to grip the rod and push it forward. As will be later described, a slip drive is provided for this mechanism so that the cement rod is supplied to the casing to keep it full whereupon the back pressure in the recessed portion 75 prevents the entry of any more of the rod until some has been used up by application to the work.

This rod-feeding mechanism is mounted upon a bracket 136 (Fig. 2) which is attached to the casing 52 and is supported thereon by means of an interposed plate 138 of Textolite or other heat-insulating material. The bracket 136 is enlarged to form a bearing 140 for the upper feed roll 132 and has an extension 142 upon which there is pivotally supported at a lower level, as may be seen in Fig. 1, a bell crank lever 144 the lower arm of which provides a pivot 146 for the lower feed roll 134. The longer arm of the bell crank provides an upstanding handle 148 drawn to the left in Fig. 1 by a spring 150, attached between the handle 148 and an adjustable screw 152 threaded in one portion of a T-shaped end 154 of the bracket extension 142. The other portion 156 of this T-shaped end serves to support an arm 158 carrying a pivot 160 for a hub 162 of a gear 163 which meshes with an idler 165 integral with a sprocket 167. The latter are carried by a stud 169 in the arm 158.

In order to provide an impositive or slip drive between the hub 162 and the upper feed roll 132 the latter is mounted on a sleeve 164 rotatable within the bearing 140. The sleeve has a headed portion which is integral with a gear 166 which meshes with another gear 168

(Fig. 3) upon the shaft of the lower feed roll **134**. This headed portion or gear **166** is in frictional contact with a collar **170** which is slotted at its outer end to receive diagonally opposed ribs **172** upon the hub **162**. The degree of friction between the collar **170** and the face of the gear **166** is controlled by a headed rod **174** (Fig. 2) passing freely through the sleeve **164** and provided with a collar **176** abutting the end of a hub **178** upon the feed roll **132**. This collar **176** is pressed against the hub **178** by a coil spring **180** which surrounds the rod and is held against the collar by an adjusting nut **182** which is held in position by a locknut **184**. It will be noted that adjustment of the compression spring **180** does not introduce any friction between the ends of the bearing **140** and the parts contacting therewith, such as the head of the sleeve **164** or the feed roll **132**, because the latter is locked to the sleeve **164** by a setscrew **165** in such a position that there is no undue friction.

It will be seen that the head portion **154** of the bracket carries a depending block **186** pressed into a notch in the bracket by a spring **187** surrounding a headed screw **189** threaded in the block and loose in the bracket. In this block is a tube **188** which is locked in position in the block **186** but which may be swung laterally with the block for cleaning. The inner end of this tube **188** is spaced from the inlet tube **76** by an air gap sufficient to prevent the transfer of heat from that inlet tube to the tube **188**. Accordingly, and because the latter tube is supported in a portion of the bracket **136** which is separated from the heated casing **52** by the Textolite plate **138**, there can never be a sufficient heating of the tube **188** to allow the rod to stick to the inner passage therein. The upper and lower portions of the tube **188** are cut away as at **190** (Fig. 1) to permit contact of the upper and lower feed rolls **132**, **134** with the rod **80** of the cement passing through. It will be understood that a supply of adhesive material such as the rod **80** will be supported upon a suitable reel or the like so that it may be drawn forward by the feed rolls without other assistance.

Sometimes, when the apparatus is shut down for adjustments or for picking up a supply of work pieces, the heat of the casing **52** will travel sufficiently along the inlet tube **76** to cause a slight melting of the surface of the rod at this point so that some soft surplus material will appear at the end of the inlet tube **76**, this being in the form of a torus. It is found in practice, however, that unless the delay is unusual, this expanded material will be drawn back into the inlet tube **76** by sticking to the incoming rod when the machine is again started up. To facilitate such an action the inner passage of the tube **76** is beveled as at **192** (Fig. 2).

To operate the apparatus in synchronism with the work feeding devices **22**, **24**, power may be supplied from a motor (not shown) through a belt **200** to a pulley **202** upon the shaft extension **58**, and this shaft in turn is connected to the work feed by a crossed belt **204** leading from a pulley **206** on the shaft. To this end, a pulley **208** (Fig. 3), receiving power from the belt **204**, is mounted upon a shaft **210** journaled in the base **10** of the machine and carrying one of the sprockets **26** which drives the chain **25**. The power imparted to the shaft extension **58** is transmitted from a sprocket **212** thereon to the sprocket **167** on the rod feed by a chain **214**.

In the operation of the machine, solid but flexible rod-shaped thermoplastic cement **80** from a source of supply is carried forward positively by the feed rolls **132**, **134** and is pushed into the inlet tube **76**, and hence the casing **52**, as fast as is permitted by the utilization of the cement from the casing. There, heat reserves from the casing and from the disk **34** melt the cement progressively at a much faster rate than as if the latter were to pass through a passageway in a fixed member. A melted portion of the cement, in a quantity determined by the setting of the doctor **90**, is carried out of the casing on the exposed portion **35** of the disk **34** and is applied to a piece of work **36** being slid along the tables **16**, **18**, at the same linear speed as that of the periphery of the disk, by means of one of the pawls **22**. Any strings extending between the upgoing portion of the disk and the work are almost instantaneously severed by the hot finger **116**, and if there is any surplus material upon either the side faces of the disk or the periphery thereof, it will be carried back into the casing by the disk with the assistance of the beveled portions **126** and the cut-back corner **130**. This eliminates any dripping from the disk upon the work or the table. When the presentation of pieces of work is interrupted so that no cement is removed from the periphery of the disk, the latter will carry this cement back into the casing, thus causing an accumulation in the portion **75** of the passage and a back pressure toward the tangential passage **74** which will be sufficient to prevent the entrance of additional portions of solid cement by reason of the action of the slip drive between the hub **162** and the upper feed roll **132**.

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, a hollow casing having an inlet and an outlet, means for heating said casing, a driven disk journaled in the casing and projecting from the outlet to apply thermoplastic cement to a piece of work, said casing fitting snugly to portions of the sides of the disk and also providing a surface close to and cooperating with a portion of the periphery of the disk to reheat it as it enters the casing, and means for feeding rod cement through the inlet to the reheated disk whereby cement received through the inlet opening will be in a melted condition as it is applied to the work by the disk after it emerges through the outlet.

2. In combination, a hollow casing having an inlet and an outlet, means for heating said casing, a driven disk journaled in the casing and projecting from the outlet to apply thermoplastic cement to a piece of work, said casing fitting snugly to and resting against at least the portions of the sides of the disk near the inlet, said casing also providing a surface close to and cooperating with a considerable portion of the periphery of the disk to reheat it as it enters the casing, and means for feeding rod cement through the inlet to the reheated disk whereby cement received through the inlet will be in a melted condition as it is applied to the work by the disk after it emerges through the outlet.

3. In combination, a hollow casing having inlet and outlet openings at spaced points on the periphery of the casing, means for heating said casing, a disk rotatably mounted in the casing and exposed at the outlet opening, and means for rotating said disk, said casing fitting snugly and resting against at least the portions of the sides of the disk near the inlet opening to transmit heat thereto and providing a restricted passage along a major portion of the periphery of the disk to the place where the latter emerges from the casing whereby cement received through the inlet opening will be dragged along the passage by the disk and applied to the work by the disk after its emergence through the outlet opening.

4. In combination, a casing made of two parts having adjacent faces, portions of which are in contact, at least one of said faces being recessed to provide a space having spaced inlet and outlet openings, a disk journaled in the casing occupying the space provided by the recess and projecting through the outlet opening, means for rotating said disk, said casing contacting the surfaces at the sides of at least the part of the disk near the inlet opening and also providing a tapered passage along a major portion of the periphery of the disk whereby cement received through the inlet opening will be dragged along to the outlet opening, and means for heating the casing whereby the disk is heated by conduction and transfers heat to the cement in the passage.

5. In combination, a hollow casing having an inlet and an outlet, means for heating said casing, a driven disk journaled in the casing and projecting from the outlet to apply thermoplastic cement to a piece of work, said casing fitting snugly to and resting against at least the portions of the sides of the disk near the inlet and providing a restricted passage along a major portion of the periphery of the disk to the place where the latter emerges from the casing, said casing also providing a surface close to and cooperating with a considerable portion of the periphery of the disk to reheat it as it enters the casing, means for feeding rod cement through the inlet to the reheated disk whereby cement received through the inlet will be in a melted condition as it is applied to the work by the disk after it emerges through the outlet.

6. In combination, a hollow casing having inlet and outlet openings near the top and bottom of the casing respectively, a disk rotatably mounted in the casing and exposed at the bottom opening, said casing contacting the sides of at least the top portion of the disk as well as a quadrant of its periphery and being cut back to provide a restricted cement passage, along a substantial portion of the periphery of the disk, connecting said inlet and outlet openings, means for heating the casing and thence the disk by conduction, means for rotating said disk to rub against cement in the passage and transmit heat to it along a quadrant similar in extent to that contacted by the casing, and means for feeding an elongated rod of thermoplastic cement into said inlet opening.

7. In combination, a block casing having a recess provided with a bottom opening, a driven disk journaled in the casing positioned in the recess and projecting through the bottom opening, means for heating the casing, said casing recess being just wide enough to receive the thickness of the disk, an inlet cylindrical passage tangential to the disk, said casing being provided with a passage extending from the inlet passage around a substantial portion of the periphery of the disk to a point closely adjacent to the point of emergence of the disk from the

casing, a scraper rotatably mounted in the casing for cooperation with the periphery of the disk adjacent to the point where it emerges from the casing and arranged upon being turned to vary the space between the scraper and the periphery of the disk, and means on the outside of the casing connected to the scraper pivot rotatably to adjust its position.

8. In combination, a hollow casing having an inlet and an outlet opening, means for heating the casing, a disk rotatably mounted in the casing and arranged to carry cement on its periphery from one opening to the other and to apply it to the work, a rotatably mounted doctor having a thickness commensurate with the thickness of the disk and provided with a flat side adjacent to the periphery of the disk, said doctor being pivoted in the casing with its pivot projecting laterally thereof, said casing contacting the major portions of the sides of both the disk and the doctor to heat them, and an arm on the outside of the casing connected to said doctor pivot and swingable to vary the relation of the flat side to the disk.

9. In combination, a casing, a disk rotatably mounted in the casing and having part of its periphery exposed beneath the casing, and a string-severing finger located above the bottom of the disk and beyond the point of contact of the latter with the work, considering the direction of rotation of the disk, to sever any strings of cement between the disk and the work.

10. In combination, a hollow casing having inlet and outlet openings near the top and bottom of the casing respectively, a disk rotatably mounted in the casing and exposed at the bottom opening, means for heating the casing to melt a thermoplastic material supplied thereto, means for rotating the disk, and a string-severing finger extending transversely of the disk from a heated block which is mounted upon but is insulated from the casing whereby the temperature of the finger may be maintained higher than that of the casing.

No references cited.