March 27, 1962 H. J. SCHRECK ETAL 3,026,833

SEWING MACHINE

Filed Oct. 8, 1957 2 Sheets-Sheet 1

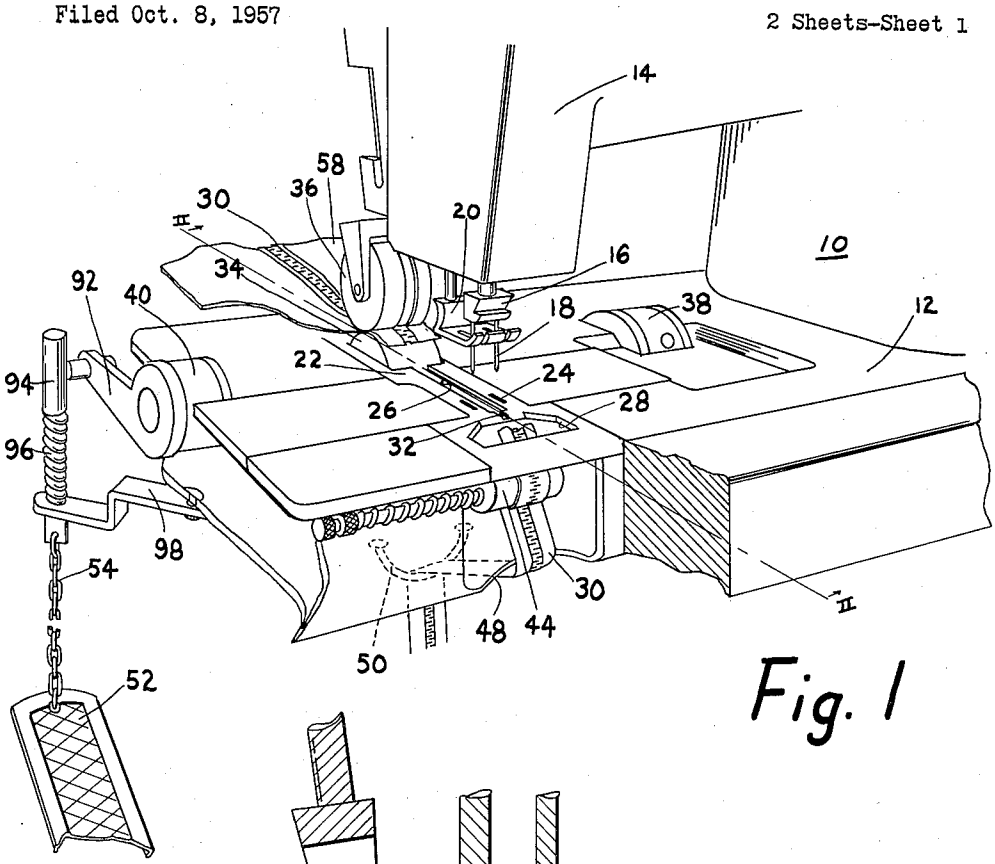


Fig. 1

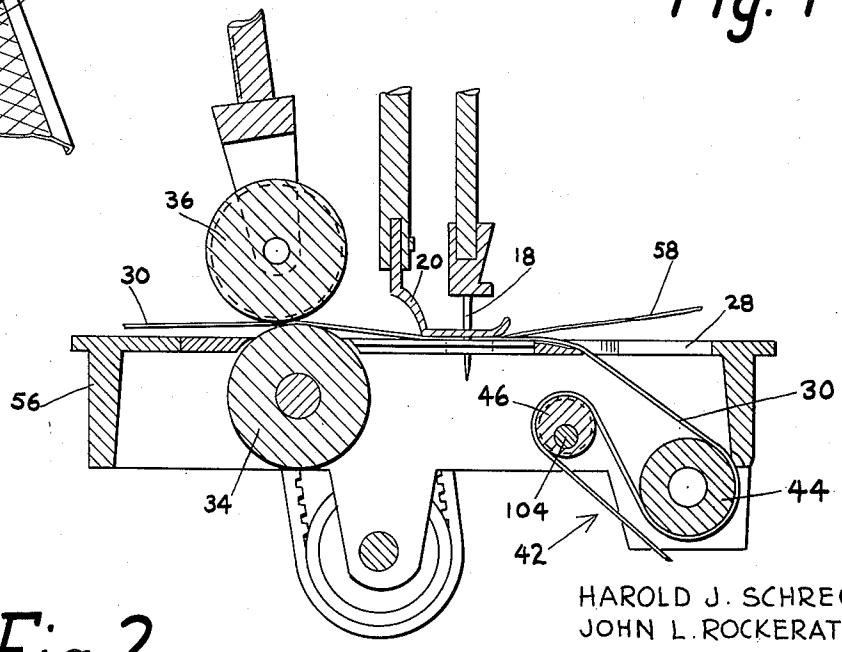


Fig. 2

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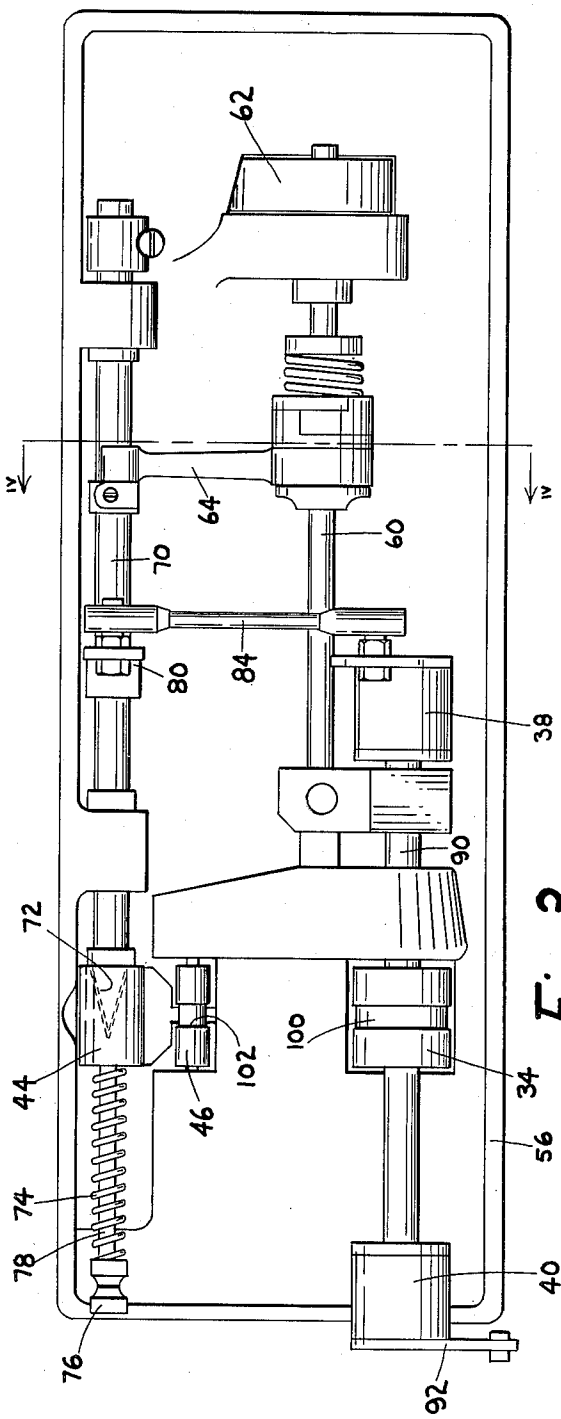


Fig. 3

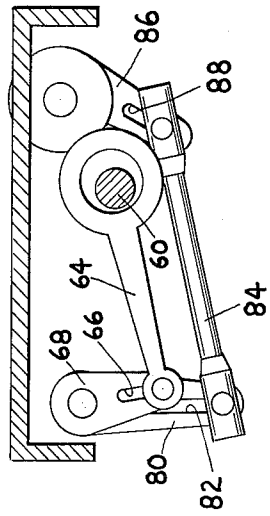


Fig. 4

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United States Patent Office 3,026,833 Patented Mar. 27, 1962

3,026,833

SEWING MACHINE

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Filed Oct. 8, 1957, Ser. No. 688,848
10 Claims. (Cl. 112—214)

This invention relates to sewing machines for attaching strips of different types of material together and more specifically to a sewing machine for semi-automatically setting zippers or other smaller pieces of material into a garment or other piece of material.

The sewing machine has been well known for many years and has been used very successfully for sewing together pieces of material to form garments, other articles of clothing and numerous articles of commerce. Generally speaking these machines have been satisfactory for the ordinary joining of like pieces and types of materials. However, under certain conditions it has been found to be extremely difficult to join together pieces of different types of material particularly where one type of material is likely to stretch relative to the other. In joining these types of materials it generally has been necessary to provide highly trained and skilled operators who can only produce a relatively low output of satisfactory products.

According to the present invention we have provided an extremely flexible sewing machine that can be readily and easily controlled by an inexperienced operator and will join together materials of different types in a superior and vastly faster fashion than heretofore. We obtain this marked improvement in sewing machines by careful, flexible control of the feeding of the material and the tension of the material together with elimination of substantially all differential friction between the materials being joined.

Accordingly it is an object of the present invention to provide a sewing machine that can be simply and easily controlled. It is another object of the present invention to provide a sewing machine that causes a minimum of frictional drag on the material as it is sewn. It is another object of the present invention to provide an improved and simplified mechanism for controlling the feeding and tension of the materials to be sewn. It is another object of the present invention to provide a novel means for permitting feeding of the material without sewing thereof. It is another object of the present invention to provide a sewing machine for sewing material in a completely unstressed condition. It is another object of the present invention to provide an improved apparatus for setting zippers in garments and the like that is easy to operate and reliable in operation. These and other and further objects will be in part apparent and in part pointed out as the specification proceeds.

In the drawings:

FIGURE 1 is a perspective view of a sewing machine embodying the present invention;

FIGURE 2 is a sectional view of line II—II of FIGURE 1;

FIGURE 3 is a bottom plan view of the driving mechanism for the feed and friction control of the device of FIGURE 1;

FIGURE 4 is a sectional view on line IV—IV of FIGURE 3;

Referring now to FIGURE 1 the sewing machine 10 according to the present invention comprises generally the bed or table 12 carrying thereon the sewing head 14 which has therein the usual needle assembly 16 carrying, in the illustrated embodiment, two needles 18 and a stripper or presser foot 20. Positioned below the sewing head 14 in cooperative relationship therewith is the throat plate 22 which has therein holes 24 cooperating with the needles

18 and an elongated slot 26 to permit sewing of zippers and the like on the machine as will be described in detail herein.

At the front edge of plate 22 there is provided an opening 28 which permits access to the material, zipper tape and the like 30 being fed into the machine from underneath the sewing table 12. There is also provided in the throat plate 22 a guiding groove 32 for accurately aligning zipper tapes and the like relative to the sewing head.

Positioned behind the sewing head 14 and plate 22 is a pair of draw rollers 34, 36. As may be seen more readily in FIGURE 2 the roller 34 is mounted within the sewing machine base and extends above the surface thereof a slight amount. Upper roller 36 is mounted at an angle to the sewing head 14 and contacts lower roller 34 as indicated in FIGURE 2. Roller 36 is spring urged into contact with roller 34 and may be lifted out of contact when desired in the conventional manner. Roller 34 is driven through either of two clutch mechanisms 38 or 40 as will be described in more detail herein. A suitable foot pedal control member 52 is connected by a chain 54 to the clutch member 40.

The zipper or other material to be sewn is fed from a continuous supply thereof (not shown) over a tension control mechanism 42 which includes a roller 44 and an eccentrically mounted friction cylinder 46 (see FIGURE 2) together with a U-shaped slot 48 cut in the casing of the sewing machine and a U ring 50 mounted underneath. Roller 44 is driven at an average speed somewhat less than that of draw rollers 34 and 36 by a mechanism that will be described herein. Both the roller 34 and the roller 44 are controlled very closely and accurately in their rotation to determine a proper tension and feeding of the material past the sewing head and the needles 18. It will be noted from FIGURES 1 and 2 that all the foregoing equipment is mounted essentially within the standard sewing machine frame 56 in a very compact and efficient manner.

As may be seen from FIGURE 2 the zipper tape 30 or other material to be joined to the garment 58 or other material passes underneath the stripper foot 20 between the rollers 34 and 36 and out to a material pick-up position (not shown). The zipper tape 30 is fed from underneath the machine up over idler 46 and around friction roller 44, under the stripper foot 20 and between the rollers 34, 36. In operation the material 58 and the zipper tape 30 are sewn together by the needles 18 and then passed on through between the rollers 34 and 36. The rollers 34 and 36 provide a pulling tension on the sewn materials and apply an equal pull on each. The stripper foot 20 is urged only very lightly by its own weight into contact with the top of the materials, essentially just to keep them in line and to prevent their being pulled apart by sewing needles 18. A stop (not shown) is provided on the shaft carrying stripper foot 20 to limit its downward movement so that only a very light pressure, essentially equal to its own weight, is applied to the material as it passes therebeneath. Of course while the pair of needles are shown for setting a zipper tape a single needle could be used or multiple needles if desired for the particular application.

Referring now to FIGURE 3 there is shown the drive linkages for the clutch mechanism 38 and the friction control for the roller 44. As may be seen in FIGURE 3 the main drive shaft 60 for the sewing machine which drives the bobbin mechanism (not shown) underneath the throat plate is driven from the motor (not shown) at the right hand end of FIGURE 3 by a belt 62 connected thereto. Shaft 60 carries thereon an eccentrically mounted arm 64 which is pivotally joined through a slot 66 in an arm 68 fixed to shaft 70 at the top of FIGURE 3. As shaft 60 rotates a reciprocating motion is imparted to shaft

70 due to the eccentric mounting of the arm 64. The degree of angular rotation of shaft 70 is controlled by the adjustment of the arm 64 relative to arm 68 in slot 66 as is customary in such types of mechanical linkages.

Shaft 70 extends to the left in FIGURE 3 until it engages the friction control assembly 44. Shaft 70 has on the end thereof a tapered cone friction bearing which engages in a corresponding bearing in the roller 44. Roller 44 is held into engagement with the cone surface 72 on shaft 70 by a spring 74 whose tension may be regulated by hand nut 76 threaded on shaft 78.

Also mounted on shaft 70 is another arm or bell crank 80 which carries in a slot 82 on the end thereof, an arm 84 which extends downwardly in FIGURE 3 to engage slot 88 in the end of bell crank 86. Bell crank 86 is one part of clutch 38 the other end of which is connected to shaft 90 upon which is mounted the draw roller 34. Clutch 38 is of the conventional overrunning friction type which is mounted on shaft 90 so that shaft 90 can only rotate in a counter-clockwise direction as viewed from the left hand end of FIGURES 1 and 3. There is thus imparted to shaft 90 an intermittent forward motion corresponding to the "forward" rotation of shaft 70, the exact extent of it, however, being determined by the relationship of the arms 80, 84 and bell crank 86. In operation this is adjusted to give the desired length of feed for each stroke relative to the stitch of needle 18 and the material to be sewn.

Also mounted on the left hand end of shaft 90 in FIGURE 3 is a second clutch 40 similar to 38 but having the bell crank 92 thereof connected through a linkage 94 to chain 54 to a foot pedal 52 mounted below the machine. Spring 96 and bracket 98 mounted on the bed 56 of the sewing machine cooperate to keep the bell crank 92 in its normally upward position.

As may be further seen in FIGURE 3 the draw roller 34 may advantageously have a groove 100 therein to permit easy passage therethrough of the metal lugs of a zipper tape. Cylinder 46 has a similar groove 102 which is used primarily to aid in guiding the zipper tape thereover and over roller 44 in a manner similar to the groove 32 in throat plate 22. As may be seen in FIGURE 2 the roller 46 is mounted eccentrically on shaft 104 which may be adjusted to position cylinder 46 relative to the roller 44 and thus determine the amount of wrap-around of zipper tape 30 about the roller 44. Thus there is provided a further adjustment for controlling the friction of the roller 44 on tape 30.

It will thus be seen from the foregoing that in operation of a zipper tape and material are fed through the machine the rollers 34, 36 which firmly engage the joined material impart an intermittent feed to the material. Since clutch 38 has an overrunning or ratchet feature the roller 34 cannot rotate in a clockwise direction as seen in FIGURE 2 and thus when the material is not being fed forward it is held stationary. Conversely, roller 44 has no overrunning or ratchet clutch attachment and thus it can move with shaft 70 in its oscillating rotation. There is thus alternatively imparted to roller 44 a slight feeding motion which feeds the zipper tape 30 and helps to withdraw it from its supply reel and then a return feed which, since the tape 30 cannot move in a reverse direction, imparts a frictional drag as it slips relative to tape 30 to create a tension in the tape of the proper magnitude to ensure accurate sewing. The difference in the amount of feeding obtained from rollers 34 and 36 and roller 44 can be adjusted in magnitude from a greater feeding by rollers 34 and 36 to a greater feeding by roll 44, by adjusting the levers 64 and 68. This in cooperation with the additional friction obtained from the tape passing over cylinder 46 through slot 48 and ring 50 enable the correct amount of tension to be applied to the zipper tape for accurate sewing. The amount of feed and return of roller 44 may be further controlled by varying the tension in spring 74 such that the roller may slide relative to shaft 70 or it may in effect move therewith as if fixed thereto. Thus the desired tension necessary for accurately sewing zipper tape may be applied.

Very often in a sewing operation it is desired to jump the material a small distance or to move it further so that the operator can get hold of a piece to perform further work thereon. With conventional sewing machines this necessitates a removal or partial removal of the material by lifting the presser foot and repositioning it relative to the sewing head. With the clutch mechanism shown at 40 and the foot pedal 52 all that needs to be done for the operator to move the material relative to the sewing head is to withdraw the needles from contact with the material and to then move the material the desired distance by applying a downward pressure to the foot pedal 52. This is translated through the linkage 94 and bell crank 92 to the clutch 40 which in turn rotates shaft 90 and thus roller 44 in a forward or counter-clockwise direction (FIGURE 2) until the desired feeding has been accomplished. This enables the operator to jump a portion of the material or to easily feed it out for removal without having to interrupt the sewing position of the following material. This together with the opening 28 which permit ready access to the zipper tape, so that it may be cut at the end of a zipper for instance, permits ready removal of a work piece from the machine without the necessity of completely repositioning and resetting all the material and zipper tape. This facilitates a greatly increased production rate and increases the efficiency of the operator.

It may be seen from the foregoing that there is provided a very flexible and easily controlled machine in which zippers or other bulky elements may be sewn to materials of different types in a simple, semi-automatic and efficient fashion. By adjusting the relative movements of the rollers 34, 36 and the friction control roller 44 the desired tension may be applied to the bottom strip of material or zipper tape 30. The throat plate 22 which has the slot 26 therein permits deforming of the lower strip 30 when it is a zipper, for instance, so that the slide may pass underneath the stripper plate 20 without distorting the upper material which is being joined thereto. This permits a much more even and superior seam to be fashioned without distortion of the relatively stiff or unflexible material all under the accurate and simple control of the operator. The floating stripper foot 20 causes an almost negligible friction on the top material. This is readily compensated for by imparting a feeding motion to the needles 18 in any conventional manner. We have thus in effect removed all frictional or other contact with the material except the desired feeling and tension control which results in a superior machine capable of performing sewing operations of a vastly improved type in a greatly improved manner.

While there is given above a certain specific example of this invention and its application in practical use, it should be understood that this is not intended to be exhaustive or to be limiting of the invention. On the contrary, this illustration and explanation herein are given in order to acquaint others skilled in the art with this invention and the principles thereof and a suitable manner of its application in practical use, so that others skilled in the art may be enabled to modify the invention and to adapt and apply it in numerous forms each as may be best suited to the requirement of a particular use.

We claim:

1. A sewing machine of the type adapted to semi-automatically join together pieces of different types of material with minimum operator attention comprising a sewing table, a sewing head mounted on said table, motor means for operating said sewing head, a throat plate mounted in said table beneath said head, a stripper foot mounted in said head, means lightly urging said foot into floating engagement with said plate, at least one sewing needle mounted in said head in operative relationship to said plate, a pair of positive feeding rollers mounted closely

adjacent said sewing needle on the output side thereof to receive therebetween the materials after they are sewn together, a plurality of spaced apart tension control rollers for at least one of the materials to be joined together mounted adjacent and beneath the other end of said throat plate said tension control rollers being spaced apart to permit selected slippage of at least one of the materials to be sewn thereover, a first clutch member operatively connected to one of said positive feed rollers to control the rotation thereof, second clutch means operatively connected to one of said tension rollers to control the rotation thereof and lever means operatively connecting said first and second clutch means to said motor means.

2. A device as described in claim 1 wherein said lever means imparts a reciprocating motion to said clutch means and said first clutch means has an overrunning ratchet member therein which permits rotation thereof in one direction only.

3. A device as described in claim 2 wherein said second clutch means has therein adjustable friction means to vary the amount of slippage between said tension roller and said lever means whereby the feeding of the material disposed about said tension roller may be accurately controlled.

4. A device as described in claim 3 wherein said lever means comprise a main shaft geared to said motor means, a first lever arm eccentrically mounted thereon, a bell crank mounted on said first clutch means, an auxiliary shaft, a pair of lever arms mounted on said auxiliary shaft, one of said arms being connected to said first arm and the other to said bell crank, and said auxiliary shaft carrying on the end thereof one element of said second clutch assembly means.

5. A device as described in claim 4 further characterized by auxiliary clutch means mounted in said sewing table, said auxiliary clutch means being operatively connected to foot pedal means and one of said draw rollers whereby material may be fed through said machine both automatically and manually.

6. In a sewing machine of the type adapted to semi-automatically join together pieces of different types of material with minimum operator attention comprising a compact automatic feeding and tension control mechanism comprising in combination a pair of draw rollers mounted at an angle to the axis of the sewing head of the machine closely adjacent the rear portion of the throat plate thereof, a plurality of tension controlling rollers mounted closely adjacent and beneath the other end of said throat plate, said rollers being spaced apart to permit controlled slippage thereover of one of the pieces of material to be joined, first and second clutch means mounted on opposite ends of the shaft of one of said draw rollers, said first clutch means being operatively connected to the main motor drive means of the sewing machine and said second clutch means being operatively connected to a foot pedal disposed adjacent to the operating pedal for the sewing machine, third clutch means operatively connecting one of soid tension rollers to said motor drive means for said sewing machine and spring adjustment means for varying the frictional coupling of said third clutch means to control the rotation of said tension rollers relative to the rotation of said draw rollers.

7. A device as described in claim 6 wherein said first clutch means comprises a pair of oppositely disposed overrunning clutch races mounted on said draw roller shafts so that said draw roller may be rotated only in the forward feeding direction and said second clutch member comprises a single ball bearing clutch race operatively connected through a bell crank to said foot pedal means

whereby said draw roller may be rotated in the forward feeding direction only by said foot pedal.

8. A device as described in claim 7 wherein said tension control clutch means comprises a pair of friction cones, one disposed in said tension roller and the other operatively connected to said motor means, a spiral spring member urging said friction cones into contact with each other, a threaded adjustment nut for varying the tension of said spring, an arcuate drag slot positioned adjacent said friction roller and auxiliary eccentrically mounted idler roller and a drag ring mounted beneath said sewing table whereby one of the materials to be sewn is passed through said drag ring over said arcuate drag surface about said idler roller and said friction roller and thence to said draw rollers, whereby accurate tension control thereof is obtained.

9. A sewing machine of the type adapted to semi-automatically join together pieces of different types of material with minimum operator attention comprising a sewing table; a sewing head mounted on said table, motor means for operating said sewing head; a throat plate member mounted in said sewing table beneath the head, a stripper foot mounted in said head above said throat plate; means positioning said stripper foot in floating engagement with said plate; at least one sewing needle mounted in said head in operative relationship to said throat plate; a pair of positive feed rollers mounted closely adjacent to the output end of said throat plate, said feed rollers being spring urged into contact with each other; at least one slipping feed roller mounted at the input end of said plate; said slipping feed roller being spaced apart from any adjacent rollers to receive, about at least a portion of the periphery thereof, at least one of the materials to be joined; first clutch means operatively connected to said motor means and to said positive feed rollers; and second clutch means operatively connected to said motor means and to said slipping feed roller.

10. A sewing machine for joining together two or more pieces of unlike materials comprising a sewing head, means for feeding said materials past said sewing head in operative association therewith including a plurality of positive feed rollers mounted on the output side for pulling the materials from the sewing head, complimentary roller means mounted on the input side consisting of one intermittently driven slipping feed roll to feed at least one of said materials toward said sewing head, and means for individually controlling the speed of said positive feed and slipping feed rollers whereby the frictional feeding of one of the materials to be joined may be adjusted to provide a dynamic tension therein of a predetermined amount.

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