

Aug. 7, 1945.

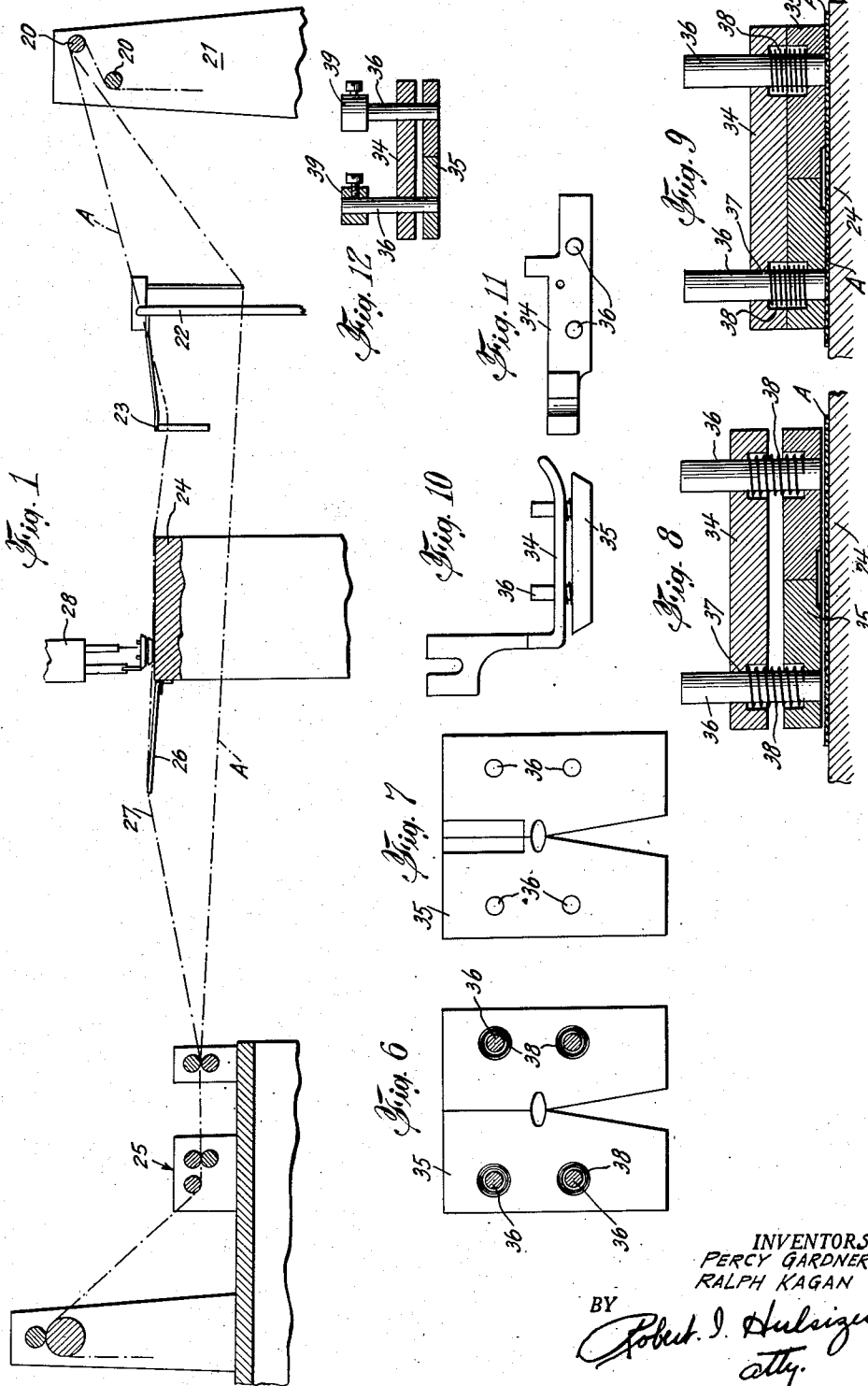
P. GARDNER ET AL

2,381,817

SEWING APPARATUS

Filed Sept. 13, 1941

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 2

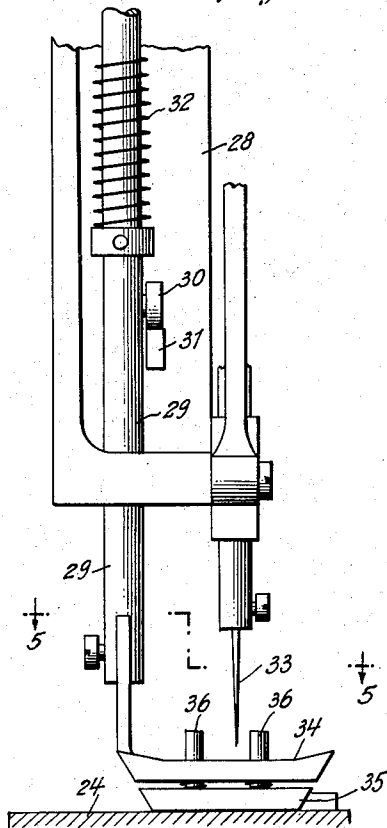


Fig. 3

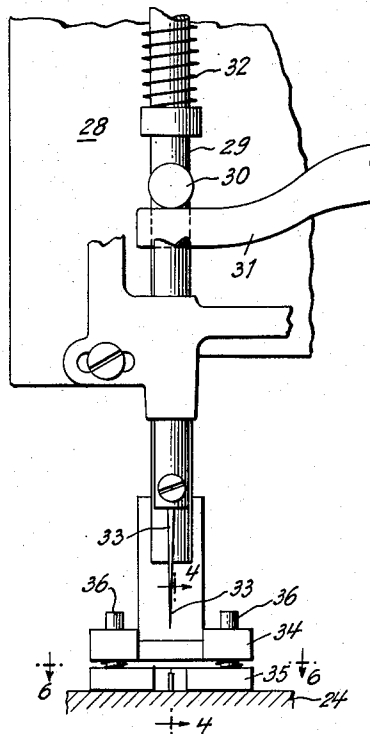


Fig. 4

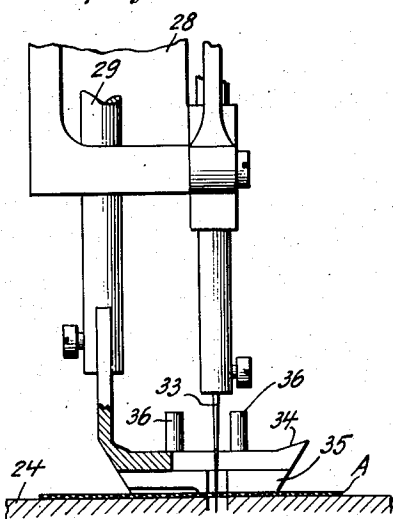
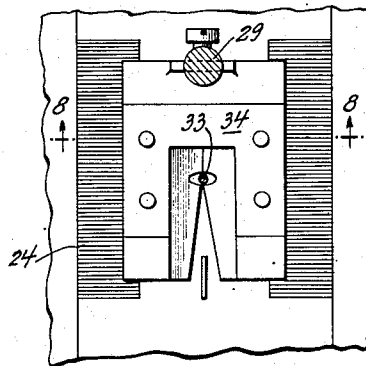


Fig. 5



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UNITED STATES PATENT OFFICE

2,381,817

SEWING APPARATUS

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Application September 13, 1941, Serial No. 410,662

7 Claims. (Cl. 112—235)

This invention relates to new and useful improvements in sewing apparatus and has particular reference to apparatus for sewing sheet material into tubular form preparatory to its being cut into bias sheets and then later cut into strips of bias-cut material for use in many trades and fashions.

Although it was in connection with the preparation of bias-cut material that this invention was developed, it is to be clearly understood, and it will become clearly apparent from a study of the matter to follow, that the use of this invention is not limited to such a line of manufacture but can be employed in almost any instance where material is to be fed past a sewing point and fastened there together.

The main object of the invention is to produce a simple, efficient and compact apparatus in and by which material can be sewed or fastened together at much greater speed, more securely, and with a minimum of effort on the part of the operator.

A further object is to provide a sewing apparatus in which the usual lower feed or clamping dog is entirely eliminated thus presenting a machine which will operate as efficiently with much less complicated structure and number of parts, thereby reducing the cost of building.

Further and more specific objects, features, and advantages will more clearly appear from a consideration of the specification to follow, especially when taken in connection with the annexed drawings which form part of the specification and which illustrate a present preferred form which the invention may assume.

The invention briefly and generally stated, with respect to one aspect thereof, has to do with a presser foot which is provided with means which, at all times during the operation of the machine on the material, will alone contact the goods with varying pressure to maintain it in position to be sewed or fastened together.

A further feature of the invention has to do with the combination of the improved presser foot and a pull-away mechanism which exerts on the goods, during the operation of moving it past the fastening or sewing point, a steady pull to tend to move it at a constant speed through the machine and which constitutes the only means for pulling the material through the machine.

A further feature of the combination with the new presser foot and the pull away mechanism is a tensioning or compensating device disposed between the fastening or sewing point and the

pull away mechanism so as to permit the pull away mechanism to continue its action while, at the instant of fastening or stitching of the material, the material is being firmly gripped and held by the presser foot, thereby preventing tearing of the goods while allowing continuous operation of all the active elements of the machine.

More particularly the novel form of presser foot concerns an ordinary presser foot to the bottom of which is attached a plate or plates which, by some form of resilient means, is pressed constantly down against the goods beneath with a varying degree of pressure dependent upon the position of the presser foot which is being constantly moved up and down by suitable means to be later described.

The apparatus as a combination may then be considered as comprising a pull-away mechanism, a tensioning or compensating device, a presser foot with resiliently operated pressure plates, and a base plate over which the material moves and against which it is at all times pressed by the foot. The general operation may well be briefly described as follows:

Assuming that the needle is up and the presser foot is also up at the top of its operative stroke, the pull-away mechanism is pulling the material through the device but the pressure plates are pressing against the goods, but not with enough pressure to stop the pull-away mechanism from causing a movement of goods past the sewing point. The compensating device is pressing against the goods to keep a part of it off the straight line from the sewing point to the pull-away mechanism so as to hold a certain length of it in reserve for purposes which will become clear as the detailed description is later set forth. Now as the needle descends, the presser foot also is timed to descend and thus presses the pressure plates much more firmly against the goods so that, as the needle passes through the material, the pressure on the goods is sufficient to hold it momentarily so that the stitch can be made and the needle withdrawn without tearing the goods. During this passage of the needle through the goods which is thus being held still, the pull-away mechanism is still acting but the compensating or tensioning device now is affected by the pull of the material to yield and allow the line of the material to change allowing enough of the tensioned goods to pass while the rest of the goods is being temporarily held at the sewing point. As soon as the needle withdraws from the goods, then the presser foot rises somewhat

and the pressure of the pressure plates is somewhat relieved so that the pull of the pull away device is again effective to allow the goods to pass through the sewing point again, although the pressure plates never, during the operation on the goods, entirely lose pressure contact with the goods, although, as above described, the degree of pressure varies periodically during the operation.

In the improved form of the machine, below the base plate over which the material passes, there is only the usual shuttle holding the lower thread to cooperate with that held by the needle. There is no lower clamping of feed dog. This novel construction thus reduces the complexity of the mechanism and materially reduces the number of the parts required for effective operation.

A present preferred form which the invention may assume is illustrated in the drawings, of which—

Fig. 1 is a somewhat schematic side elevation of a portion of the apparatus showing the longitudinal relation of the pull-away mechanism, the compensating device, and the new form of presser foot together with several guide devices which are employed to guide the material effectively to the sewing or fastening point;

Fig. 2 is a side elevation of a portion of the new and improved presser foot showing the needle in the uppermost position;

Fig. 3 is a similar view in end elevation of the presser foot;

Fig. 4 is a vertical cross section taken on the line 4—4 of Fig. 3;

Fig. 5 is a horizontal cross section taken on the line 5—5 of Fig. 2;

Fig. 6 is a horizontal cross section taken on the line 6—6 of Fig. 3;

Fig. 7 is an inverted plan view of the pressure plate shown in Fig. 6;

Fig. 8 is a vertical cross section taken on the line 8—8 of Fig. 5, showing the parts in the position of minimum pressure;

Fig. 9 is a similar view showing the parts in the position of maximum pressure;

Fig. 10 is a side elevation of a portion of a modified form of presser foot with a single pressure plate attached;

Fig. 11 is a plan view of the parts shown in Fig. 10; and

Fig. 12 is a cross section through a still further modified form of presser foot.

The form of the invention shown in the drawings is one which has been developed through trial and tests as the present form preferred to achieve the results intended. Figure 1 somewhat diagrammatically shows the general layout of the various elements of the improved machine and is somewhat similar to a lay-out shown in our co-pending application Serial Number 384,224, entitled "Apparatus for forming tubular material," filed March 19, 1941. The figure shows the material A being unwound from a roll (not shown) in flat sheet form over guiding rollers 20 on a suitable support 21 and then through guide members 22 and 23 over the bed 24 of a sewing device, which, however, may be a fastening device other than a sewing machine. The sewed or fastened material now in tubular form passes from the bed 24 to a pull away device indicated generally by the number 25 which is generally and basically similar to the one shown in the above-mentioned application. The pull away device 25 is designed to exert on the material a steady even pull and constitutes the only means in the entire apparatus

to exert force on the material to cause it to move through the machine. Between the bed 24 and pull-away device 25 is disposed a compensating or tensioning device 26 which not only keeps the goods under tension but also keeps the line of sewing 27 at that point somewhat off-side of the direct line between the bed and the rollers of the pull-away device for a purpose later to be described.

As the material passes over the bed 24 it is fastened together and the form shown is the form preferred, namely, a sewing device, although it is to be understood that the action later described is such that other means of fastening the material than sewing may be employed. The sewing device comprises a sewing head 28, provided with a vertically reciprocable presser foot rod 29 on which is a stud 30 engaged by the end of an arm 31, said arm 31 being adapted in any suitable manner (not shown) to be oscillated by a suitable means during the operation of the machine so as to raise and lower the rod 29. A spring 32 connected to the rod 29 tends to move it downwardly at all times. The head also supports the usual reciprocable needle 33 driven in the usual manner to move to and from the material.

On the lower end of the rod 29 is a presser foot having a main body portion 34. Since this main body portion 34 is fastened to the lower end of the rod 29 it rapidly rises and falls with said rod and therefore its distance from the goods varies during the operation of sewing the material. Disposed below this main body portion 34 is a pressure means which, regardless of the position of the portion 34, will always maintain at least a certain minimum contact pressure with the material. This variable contact pressure is greatest at the time the needle is passing through the goods and least when the needle is at the highest point of its stroke, although it is always sufficient to maintain control of the material and prevent it from moving under the foot unless pulled by the pull-away device. In other words, the material under the foot is at all times under the control of the foot. When the sewing is actually taking place, the foot holds the goods so firmly that the pull-away device itself could not move it but when the sewing is not actually taking place then the presser foot device still holds the goods but with lesser pressure so that the pull-away device can pull the goods past the sewing point.

The preferred form of the means above mentioned which has been adopted is an auxiliary plate 35 which is disposed directly beneath the main body portion 34 and lies on the goods. This auxiliary plate may also be of one or two pieces as shown in Figures 11 and 6 respectively. The contact means is preferably not directly connected to the main body portion 34 but is provided with pins 36 which extend up through holes 37 in the portion 34. Springs 38 surround the pins 36 between the portion 34 and plate 35 and tend to push the lower plate away from the main body portion 34 at all times. In the modified form of the plates shown in Fig. 12, the push away force is provided by weights 39 on the tops of the pins 36 instead of the springs 38. The two forms of plates employed are merely indicative of the fact that the kind of plates used is dependent upon the kind of sewing or fastening which is being done as well as the kind of stitch and also on the kind of material being treated.

A general description of the operation will turn the attention particularly to Figures 2 and 4, the first of which shows the parts in position when

the needle is at the top of its stroke, and the other of which shows the parts in position when the needle is at the bottom of the stroke. When the needle is as shown in Fig. 2, the main body portion 34 is moved up against the action of the spring 32 by means of the cam-operated arm 31 and is at its highest point or distance away from the lower plate 35 which is still being pressed against the goods by means of the springs 38. It will be clear that in this position the springs 38 are not under much compression and therefore are pressing the plate 35 as lightly as possible upon the goods but sufficiently to maintain control on the goods. At this point, then, in the operation, the pull-away device 25 is able to advance the goods past the sewing or fastening point.

As the needle starts down on its travel to the goods the main body portion 34 also starts down and therefore slowly increases the compression of the springs 38 and approaches the plate 35. The portion 35 is allowed to do this by the lowering of arm 31 and the downward pressure of the spring 32. As the needle starts through the goods the portion 34 is all the way down and pressing flat on top of the lower plate 35 and the spring 32 is exerting its full pressure to hold the two plates together. This pressure is sufficient upon the goods to overcome the pulling tendency of the pull-away means 25 and the goods consequently stands still for an instant. If this were not allowed for, the goods between the sewing point and the pull-away device would be subjected to an abnormal strain, but this is where the compensating device comes into play. As the goods at the sewing point stops moving for an instant, the pull on the material causes the compensating device 26 to start being pulled down so that the off-side relation of the goods along the sewing line is changed toward a direct line relation and the compensating device thus gives the pull-away device a little of the material which it has thus far been holding off-side. This allows the goods between the sewing point and the pull-away to move while at the same time the goods right at the sewing point are being held for an instant stationary. Therefore undue and abnormal strains on the goods are avoided. As soon as the needle starts up again the rod 29 also starts up slowly releasing the compression on the springs 38 so that, as the needle comes out of the goods, the compression has been reduced a sufficient amount so that the contact pressure of the plate 35 on the goods, while holding the goods under control, will permit the pull-away device to advance them forward a predetermined distance. This cycle of operations is of course repeated at high speed and the goods has been delivered to the sewing point smoothly and under perfect control and even tension and has been drawn away from said point under equally smooth and even tension.

It may be noted that nothing has been said thus far of a feed dog below the bed 24 for the simple reason that in this machine there is no such device. The only element below the bed 24 is the usual shuttle containing the usual lower thread to cooperate with the one carried in the usual manner by the needle. As far as we know, this is the first device in which material can be fastened or sewed together at high speed and under perfect control, as demonstrated many times in actual practice, without the use of a lower dog which not only does not feed the material but also does not even momentarily clamp

it. In the above-mentioned application mention is made of a lower dog which does not feed but which does clamp the material momentarily as sewing actually takes place. In this machine even this is done away with and no lower dog at all is used. This simplifies the construction, reduces the likelihood of parts getting out of order, while at the same time it has enabled the goods to be sewn at high speeds and under such uniform control that at times it is not even necessary for the operator to guide the goods to the sewing point for minutes at a time.

While the invention has been described in detail herein as to a preferred form, it is to be clearly understood that many changes and modifications may be made in the construction without departing from the spirit and scope of the invention set forth, and it is not intended therefore to limit the invention to the particular form shown but only in so far as it may be limited by the scope of any one or more of the appended claims.

We claim:

1. In a sewing machine having a sewing point and a reciprocatory needle at the sewing point and without a lower feed dog, the combination of means spaced apart from the sewing point and providing a continuous pull on the material tending to pull it past the sewing point, means to reciprocate said needle in synchronism with the speed of the pulling means, a presser foot adjacent the needle and having a main body portion, means to reciprocate the main body portion toward and away from the material being sewn in cyclical relation to the movement of the needle, and means on the presser foot and engaging the material at all times with a varying pressure depending upon the position of the main body portion of the presser foot with respect to the material.

2. In a sewing machine having a sewing point and a reciprocatory needle at the sewing point and without a lower feed dog, the combination of means spaced apart from the sewing point and providing a continuous pull on the material tending to pull it past the sewing point, means to reciprocate said needle in synchronism with the speed of the pulling means, a presser foot adjacent the needle and having a main body portion, means to reciprocate the main body portion toward and away from the material being sewn in cyclical relation to the movement of the needle, a plate disposed below and supported from the main body portion of the presser foot and engaging the material at all times, and means for causing the plate to press upon the material with a pressure varying in accordance with the position of the main body portion with respect to the material.

3. In a sewing machine having a sewing point and a reciprocatory needle at the sewing point and without a lower feed dog, the combination of means spaced apart from the sewing point and providing a continuous pull on the material tending to pull it past the sewing point, means to reciprocate said needle in synchronism with the speed of the pulling means, a presser foot adjacent the needle and having a main body portion, means to reciprocate the main body portion toward and away from the material being sewn in cyclical relation to the movement of the needle, a plate disposed below and supported from the main body portion of the presser foot and engaging the material at all times, and resilient means disposed in association with the main body

portion and the lower plate and tending always to move the plate away from the main body portion and to press it against the material, said pressure varying in accordance with the position of the main body portion with respect to the material.

4. In a sewing machine having a sewing point and a reciprocatory needle at the sewing point and without a lower feed dog, the combination of means spaced apart from the sewing point and providing a continuous pull on the material tending to pull it past the sewing point, means to reciprocate said needle in synchronism with the speed of the pulling means, a presser foot adjacent the needle and having a main body portion, means to reciprocate the main body portion toward and away from the material being sewn in cyclical relation to the movement of the needle, means on the presser foot and engaging the material at all times with a varying pressure depending upon the position of the main body portion of the presser foot with respect to the material, and resilient means between the sewing point and the pulling means and engaging the sewn seam to divert the seam at the engaged point from the direct line from the sewing point to the pulling means.

5. In a sewing machine having a sewing point and a reciprocatory needle at the sewing point and without a lower feed dog, the combination of means spaced apart from the sewing point and providing a continuous pull on the material tending to pull it past the sewing point, means to reciprocate said needle in synchronism with the speed of the pulling means, a presser foot adjacent the needle and having a main body portion, means to reciprocate the main body portion toward and away from the material being sewn in cyclical relation to the movement of the needle, a plate disposed below and supported from the main body portion of the presser foot and engaging the material at all times, and means for causing the plate to press upon the material with a varying pressure in accordance with the position of the main body portion with respect to the material, and resilient means between the sewing point and the pulling means and engaging the sewn seam to divert the seam at the engaged point from the direct line from the sewing point to the pulling means.

6. In a sewing machine having a sewing point and reciprocatory needle at the sewing point and without a lower feed dog, the combination of means spaced apart from the sewing point and providing a continuous pull on the material tending to pull it past the sewing point, means to reciprocate said needle in synchronism with the speed of the pulling means, a presser foot adjacent the needle and having a main body portion, means to reciprocate the main body portion toward and away from the material being sewn in cyclical relation to the movement of the needle, a plate disposed below and supported from the main body portion of the presser foot and engaging the material at all times, and resilient means disposed in association with the main body portion and the lower plate and tending always to move the plate away from the main body portion and to press it against the material, said pressure varying in accordance with the position of the main body portion with respect to the material, and resilient means between the sewing point and the pulling means and engaging the seam to divert the seam at the engaged point from the direct line from the sewing point to the pulling means.

7. In a sewing machine having a sewing point and a reciprocatory needle at the sewing point and without a lower feed dog, the combination of means spaced apart from the sewing point and providing a continuous pull on the material tending to pull it past the sewing point, means to reciprocate said needle in synchronism with the speed of the pulling means, a presser foot adjacent the needle and having a main body portion, means to reciprocate the main body portion toward and away from the material being sewn in cyclical relation to the movement of the needle, means on the presser foot and engaging the material at all times with a varying pressure depending upon the position of the main body portion of the presser foot with respect to the material, and yielding means between the sewing point and the pulling means and engaging the material to divert the material from the direct line from the sewing point to the pulling means.

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