April 26, 1966 C. G. HART ETAL 3,247,813

METHOD AND APPARATUS FOR MAKING AIR FILTERS

Filed July 5, 1963 4 Sheets-Sheet 1

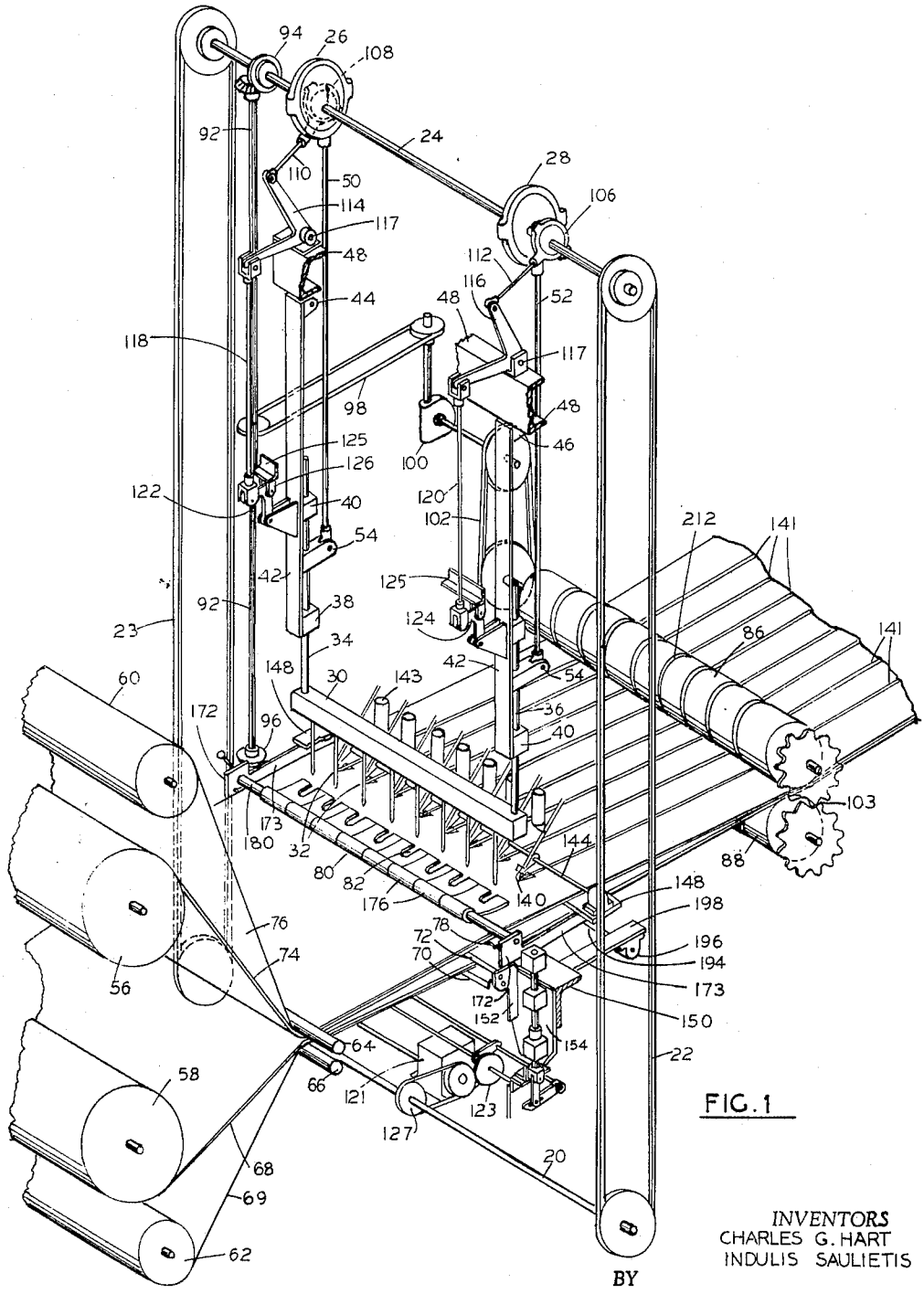


FIG. 1

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METHOD AND APPARATUS FOR MAKING AIR FILTERS

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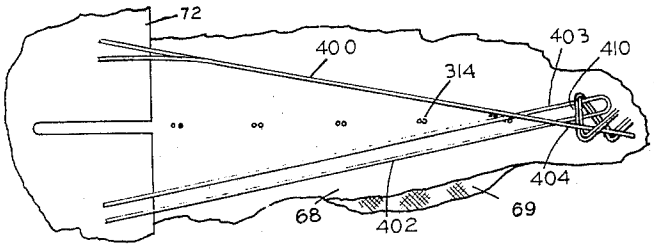
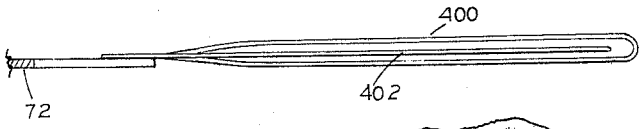


FIG. 8

FIG. 9



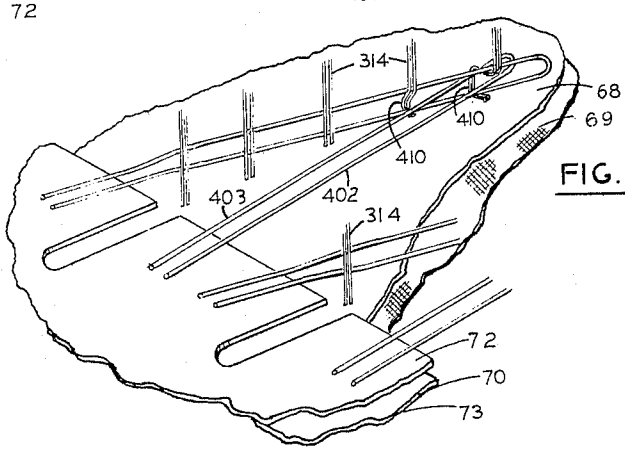


FIG. 7

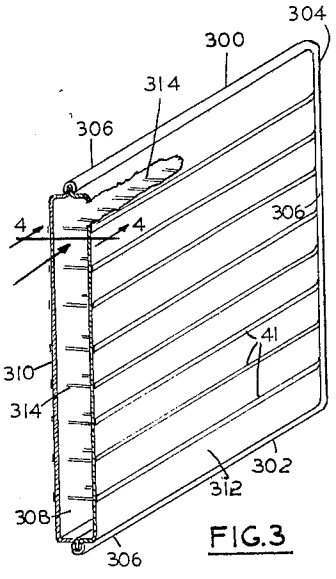


FIG. 3

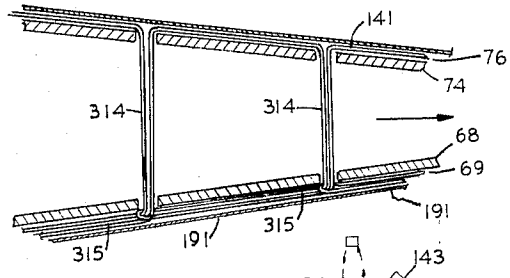


FIG. 4

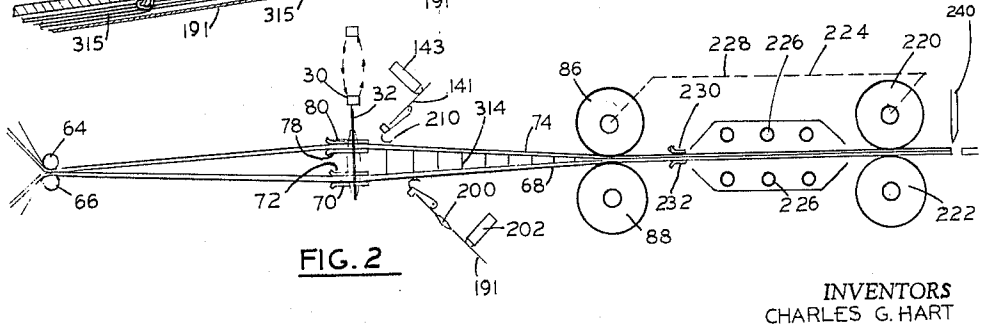


FIG. 2

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METHOD AND APPARATUS FOR MAKING AIR FILTERS

Filed July 5, 1963 4 Sheets-Sheet 3

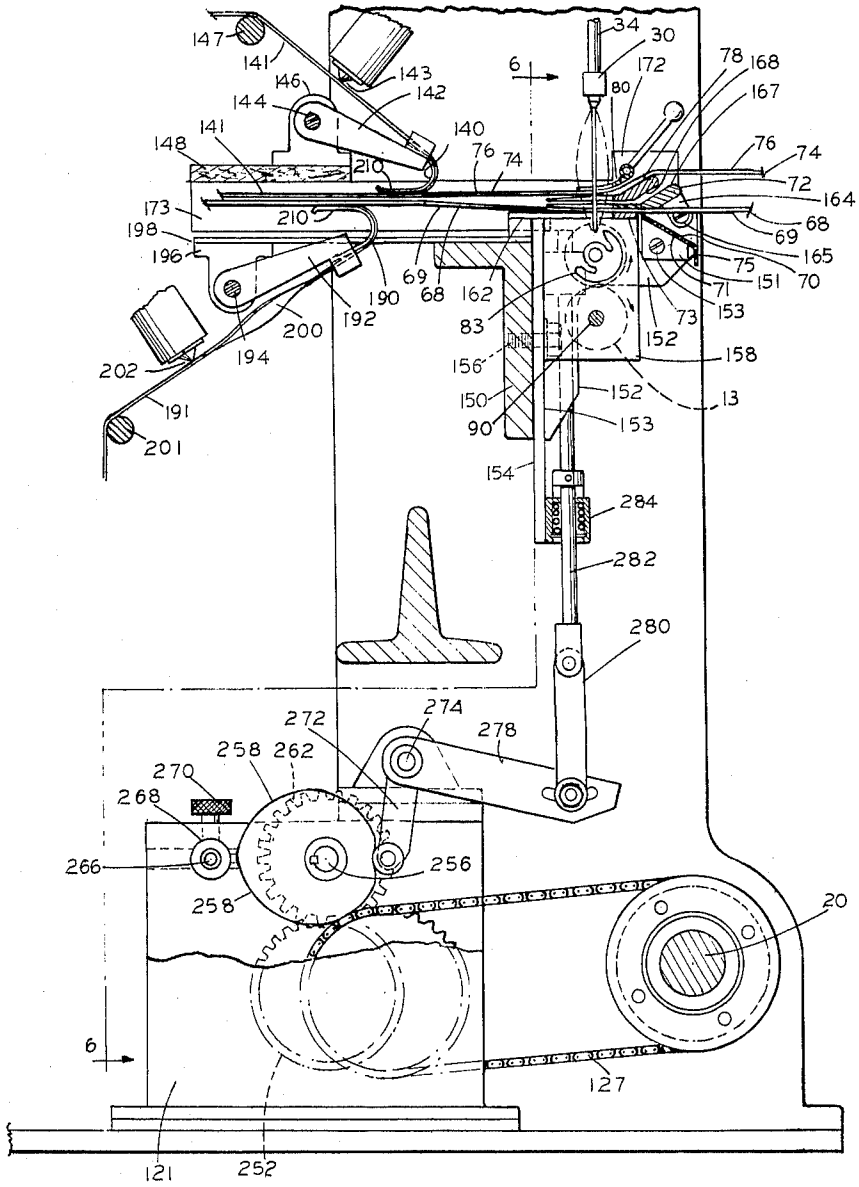


FIG. 5

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METHOD AND APPARATUS FOR MAKING AIR FILTERS

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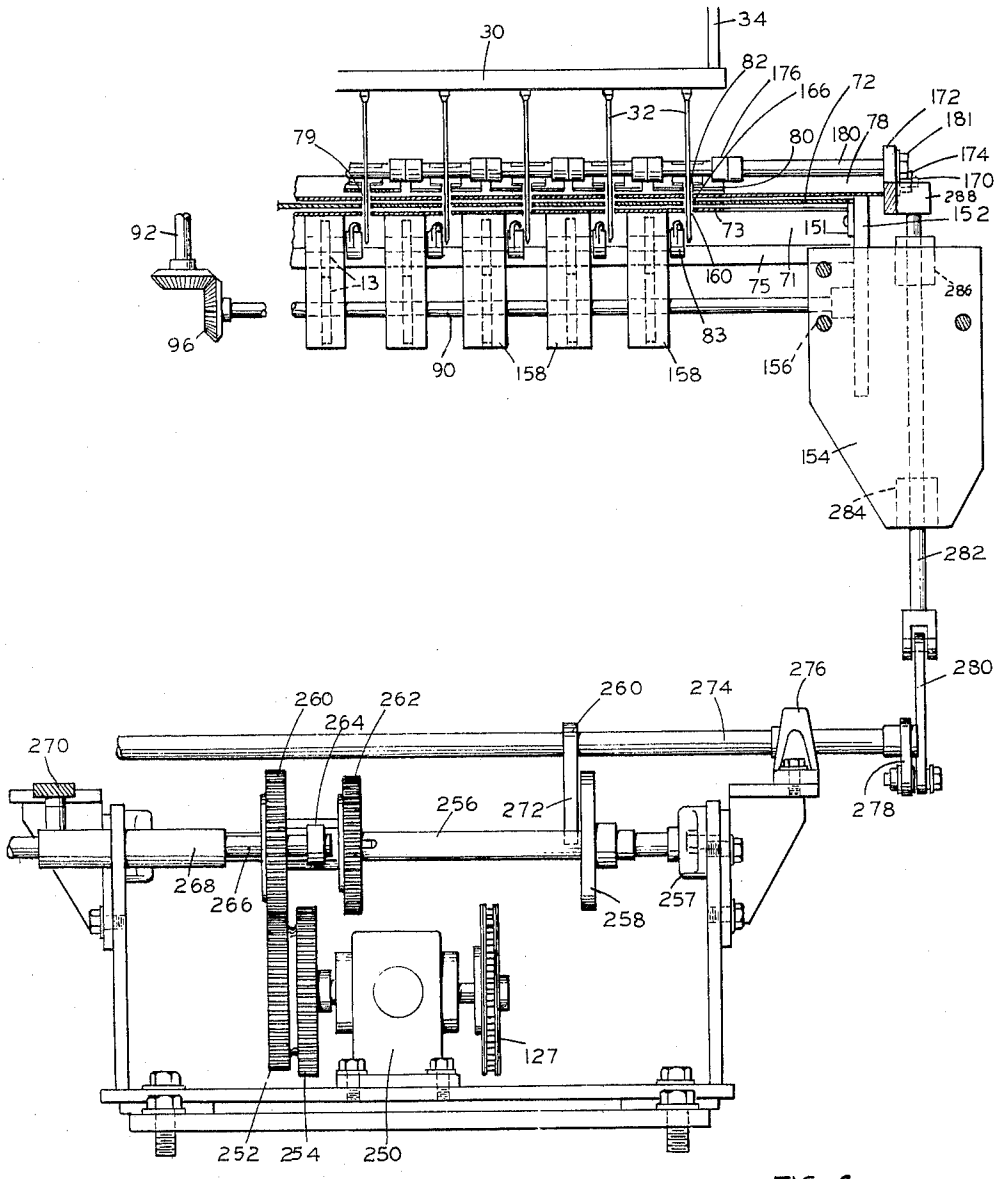


FIG. 6

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United States Patent Office 3,247,813 Patented Apr. 26, 1966

3,247,813

METHOD AND APPARATUS FOR MAKING AIR FILTERS

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Filed July 5, 1963, Ser. No. 293,098
10 Claims. (Cl. 112—2)

This invention relates to apparatus for fabricating pockets for multiple pocket air filters, wherein variable length thread stays are employed to limit the spacing between pocket walls.

In a copending application, Serial No. 192,238, filed May 3, 1962, now Patent No. 3,190,059, there is disclosed a multiple pocket air filter wherein the pockets are sustained, at least in part, by the air pressure differential, due to air flow through the filter media from which the pocket is fabricated. Each pocket comprises two rectangular sections of filter media bound together along two sides and closed as by binding at one end, and open at the other end. The open end is secured to an elongated rectangular frame which is disposed vertically, and through which air enters the pocket. A plurality of such pockets and vertical frames are disposed side by side and are mounted in a unit frame, and the pockets are adapted, when subjected to flow of air into the pocket, to be sustained in vertical planes by the pressure differential from the flow of air through the filter media. In order to hold the two sections or flanks of each pocket so as to lie substantially in planes converging from the elongate sides of the elongated frame, or the open end to the closed end, a plurality of parallel rows of thread stays connecting the pocket flanks are produced by stitching, the rows being parallel with the side edges of the pockets, the side edges being the top and bottom of each pocket, when installed in a filter system. The stays in each row gradually diminish in length from the open end to the closed end. The stays assist each pocket in taking an extended inflated position by reason of the differential air pressure from air flow through the media, and each pocket is supported solely from its open frame end, with assistance of the differential pressure resulting from the air flow. The stays keep the flanks of adjacent pockets substantially planar and out of contact, so that the entire area of the flanks of each pocket are maintained effective for filtration.

The present invention is directed to a multiple stitching apparatus for rapidly forming rows of stays between two strips of filter media, such that the length of the stays gradually vary to produce the pockets above described. More particularly the invention is directed to stitching apparatus which continuously forms rows of stitches with stays varying in length between two sheets of filter media continuously supplied to the apparatus from two supply rolls. Further the apparatus comprises means for forming a plurality of rows of chain stitches between two wide strips of media, wherein, as the stitches are formed, the spacing between the two sheets are caused to be gradually varied, whereby to form the stays, the length thereof depending upon the spacing between the strips or sheets when each stitch is formed. The spacing between the two strips or sheets of media is gradually varied from a spacing approximately the width of the open end of the pockets to be formed to a spacing approaching zero, as the media passes through the stitching region. The sheets or strips are subsequently cut transversely into rectangular sections at the transverse lines of maximum and minimum stay length, and each section is thereafter bound along its side edges, and the end edge adjacent the short stays, to provide

a pocket, the open end of which is adapted for attachment to the supporting elongated rectangular frame referred to. Provision is made for sealing the punctures made in the filter media by the stitching needles, by applying a sealing adhesive, either directly, or by applying the sealing adhesive to narrow tapes applied to the opposite sides of the media strips along the rows of stitches, as they are formed.

The above and other novel features of the invention will appear more fully hereinafter from the following detailed description when taken in conjunction with the accompanying drawings. It is expressly understood that the drawings are employed for purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

In the drawings, wherein like reference characters indicate like parts:

FIGURE 1 is a schematic perspective view of the stitch stay forming portion of the apparatus;

FIGURE 2 is a schematic side view of the complete apparatus;

FIGURE 3 is a perspective view of a pocket formed from material produced by the machine, a portion being broken away;

FIGURE 4 is an enlarged framentary sectional view along one row of stays, taken substantially on the plane 4—4 of FIGURE 3;

FIGURE 5 is a sectional view through the stitching head, and guide plates;

FIGURE 6 is a sectional view taken substantially on the line 6—6 of FIGURE 5;

FIGURE 7 is a fragmentary perspective view of tensioning spring mechanism for holding the stitching stays taut;

FIGURE 8 is a plan view of the one pair of tensioning springs; and

FIGURE 9 is an elevational view of a pair of tensioning springs.

Referring to FIGURE 1 of the drawings, there is diagrammatically shown a long stroke multiple needle stitching apparatus adapted to form a series of rows of stitches lengthwise along the length of two strips of filter media, as the spacing between the strips is varied, so as to form connecting thread stays of varying length between the two strips of fabric or media. As shown, there is a main power driven shaft 20, from which is driven, by belt drives 22 and 23, an overhead shaft 24 having thereon spaced eccentrics 26 and 28, which effect vertical reciprocation of a needle bar 30. The needle bar 30 is provided with a plurality of long needles 32, projecting downwardly, to form the rows of stitches. As indicated, the needle bar at its ends is provided with guide rods 34 and 36 slidably disposed in spaced guide blocks 38 and 40 affixed to spaced hanger members 42 and 42, pivotally supported as at 44 and 46 upon a transverse member 48 of the frame. Connecting rods 50 and 52 from the eccentrics 26 and 28 have their lower ends affixed to the rods 34 and 36 as at 54.

Two sheets of filter media from two supply rolls 56 and 58 mounted on a suitable frame, not shown, and two sheets of thin mesh fabric, or netting from two supply rolls 60 and 62 also supported on a suitable framework, not shown, are brought together between rods 64 and 66, from which the two strips of media and netting are drawn into the stitching apparatus. The lower strip of media 68 and its mesh fabric 69 disposed on the underside, are drawn between a pair of stationary guide plates 70 and 72, while the upper strip of media 74, with its mesh fabric 76 are drawn between a pair of guide plates 78 and 80, the upper guide plate being formed from

a plurality of bifurcated feet **176**. The guide plate **78** and guide plate **80**, formed by feet **176** are caused to reciprocate vertically together, toward and away from the guide plates **70** and **72**. All of the guide plates **70**, **72**, **78** and **80** have aligned open slots extending from their rear edges, such as indicated at **82** in the feet **80**, to receive the needles **32**.

The filter media strips **68** and **74** and their respective mesh fabric **69** and **76** are brought together beyond the stitching plates between reversely rotating traction rolls **86** and **88** which continuously draw the media **68** and **74** and mesh **69** and **76** between the guide plates **70**, **72** and between the guide plates **78** and **80** respectively.

Each of the needles **32** has an eye in its pointed end and is provided with a supply of thread (not shown) as will be well understood in the art, and beneath the plate **70**, there are provided rotating loopers or loop forming hooks **83** for each needle to effect chain stitching, in the usual manner, also well known to the art (see FIGURES 5 and 6).

In practice, the strips of media, are drawn between the guide plates **70**, **72** and between the guide plates **78** and **80** at a rate in reference to the rotation of the overhead shaft **24**, to produce a stay forming stitch at intervals of approximately ¾ of an inch. The rotary loop forming hooks **83** for effecting the chain stitching are driven by a common shaft **90** disposed below the plate **70**, and such shaft may be driven from the shaft **24** at the same rate of speed, by a vertical shaft **92** and pairs of bevel gears **94** and **96**. The traction rolls may be driven from the shaft **92** by a chain and sprocket drive **98**, a worm and gear **100**, and a further chain and sprocket drive **102** to one of the traction rolls **86** and **88**, the two rolls being geared to rotate together as at **103**.

Since each stitch is formed while the media strips travel continuously between the guide plates **70**, **72** and between the guide plates **78** and **80** at a uniform rate of speed, provision is made for causing the needle bar to move in the direction of movement of the media strips when the needles **32** are projected into and through the media strips to effect each set of stitches. To effect such movement, a second set of eccentrics **106** and **108** are provided on shaft **24** which operate connecting rods **110** and **112** extending to bell cranks **114** and **116** pivoted as at **117** on the frame member **48**. The bell cranks, through links **118** and **120** actuate lower bell cranks **122** and **124** pivoted upon a second frame member **125**, as at **126**, and such bell cranks are connected to the hanger members **42**, **42**, so that the hanger members rock to and fro with each revolution of the shaft **24**, and thereby impart movement to the needles in the direction of the movement of the media strips during the lower half of the needle stroke when the needles are projected into the media to form the stitches. It will be understood that the needles when at their upper end of their stitching stroke, and free of the media, are moved in a reverse direction to the movement of the media, to relocate the needles for each successive set of stitches. Where stitches ¾" long are effected, the needle movement referred to may be in the order of ⅜ of an inch.

In practice, the spacing between the lower guide plates **70** effected by the relative movement between the lower guide plates **70** and **72** and the upper guide plates **78** and **80**, will vary from a maximum of about 2 inches or less, to a minimum, as close to zero as desired, the minimum being determined by the combined thicknesses of the lower plate **78** of the upper pair of guide plates and the upper plate **72** of the lower pair of guide plates and the tension on the threads.

Movement of the guide plates **78** and **80** is effected by a constant rise and fall cam mechanism, hereinafter referred to more in detail, and generally indicated at **123** in FIGURE 1. The cam is driven through suitable gearing indicated at **121**, by a sprocket and chain drive **127**, from the main shaft **20**.

In practice the filter media may be in strips 24" wide, or of any desired width within the limits of the machine bed, and eight rows of stitches laterally spaced about 2½" may be provided and the vertical reciprocating movement of the guide plates **78** and **80** may be coordinated with the rate of travel of the media such that the plates **78** and **80** will move from their low position to the high position and back to the low position once upon passage of a selected length of media, as for example 4 feet, or six feet, depending upon whether two pockets of 24 inch depth or two pockets of 36 inch depth are to be formed per length of material selected.

Referring to FIGURES 5 and 6 wherein the guide plates and stitching mechanism are shown in greater detail, it will be seen that the lower guide plate **70** is in two parts, comprising a guide chute **71** having an apron or flange **75** supported by its end flanges **151** affixed as at **153** to inverted L shaped bracket plates **152** welded or otherwise attached to mounting plates **154**, said plates **154** being in turn secured to the transverse angle iron **150** of the main frame as by bolts **156**. The second part **73** of the guide plate **70**, is mounted immediately above the looper gear boxes **158**, and is provided with slots **160**, one for each needle **32**. Such plate may be supported from the angle iron **150** in any suitable manner, as on spaced blocks **162**. The guide plate **72** has end ears **164**, secured as at **165**, to the end bracket plates **152** and has an inclined flare as at **167**, and is slotted as at **166** to receive the needles. The plate **72**, and plates **71** and **73** are fixedly spaced to permit the free passage of the lower sheet of filter media **68**, and its mesh **69**.

The upper guide plate **78** is shaped as at **168** to nest upon the guide plate **72**, and its ends abut elevating plates **172**, and are provided with threaded projections **170** extending through an aperture in the end elevating plates **172**, and are clamped thereto by nuts as at **174**. The guide plate **78** is also slotted as at **79** for the needles **32**. The upper guide plate **80** is made up of a plurality of individual guide feet **176**, each slotted as at **82** to clear the needles **32**, the feet being affixed to a rod **180** extending between the elevating plates **172**, to which it is secured by nuts **181**. The rod **180** is fixed in the plates **172** against rotation, and the feet **176** are spaced from the plate **78** so as to provide necessary clearance for the passage of the media strip **74** and its mesh **76**.

In order to seal the small punctures in the two strips of media by the needles as each stitch is formed, a narrow tape, having adhesive applied thereto is applied to the upper web **76** and media **74**, and to the lower web **69** and along the line of each row of stitches. A guide **140** for the application of each tape is supported on arms **142**. The guides **140**, and a supporting arm **142** for each, for applying the tapes **141** to the upper strip of media and its mesh are supported from a transverse rod **144**, mounted in brackets **146** on a transverse plate **148** of plywood or the like, supported on the extensions **173** of the riser members **172**. It will thus be seen that the guides **140** supported from the rod **144** rise and fall with the media **74** and its mesh **76**. Adhesive is applied to one side of each tape **141** as by individual nozzles **143**, supported from the member **148** in any suitable manner (not shown). The tape is supplied over any suitable guide such as **147**, from spools, not shown.

The lower tapes **191** are applied to the underside of the media **68** and its mesh **69** as by tape guides **190**.

Such guides indicated at **190**, are supported from arms **192** extending from a transverse rod **194** supported on spaced brackets **196** mounted on arms such as **198** extending from the frame member **150**, near the ends thereof. The tapes in being fed to the guides **190**, which apply the tapes to the underside of the mesh covered media are given a half twist as at **200**, after passing over a guide **201** and application of adhesive to

one side thereof, as by adhesive nozzles 202. Thus the application of adhesive to the tapes 191 may be effected with the aid of gravity, and the adhesive face of the tape in turn applied to the mesh and media. Each of the guides 140 and 190 have spring tape laying portions 210, which press the tape upon the media as it leaves the stitch stay forming mechanism.

The traction rolls 86 and 88 are provided with friction surfaces for engaging the mesh fabric, and are likewise provided with grooves 212, wider than the tape, at each line of stitches over which a tape with sealing adhesive has been applied, so that the traction applied to the filter media and mesh strips does not engage or disturb the tapes which have been applied. As is indicated in FIGURE 2, the two strips of filter media, after leaving the traction rolls 86 and 88, are drawn over an extended course by a second set of traction rolls 220 and 222 which are coordinated by a synchronized drive indicated at 224 in respect to speed so as to draw the two strips of filter media, with mesh fabric and sealing tapes through a region wherein the upper and lower surfaces are subjected to heat radiation, by a plurality of radiant heaters indicated as at 226, in reflectors 228. Prior thereto the filter media strips, mesh fabrics and tapes are drawn between spaced transverse metal irons, 230 and 232 adapted to compress the tapes against the fabric at a stage before the adhesive is ready to set, and the subsequent subjection of the strips, mesh and tapes to the infra-red heat completes the setting of the adhesive sealant, prior to the filler media strips reaching the traction rolls 220, 222.

The two strips of filter media, mesh and sealing strips after leaving the traction rolls 220, 222 are cut in rectangular sections as by a cutting blade 240 which cuts transversely across the media, the cuts being made at uniformly spaced intervals such as 24" or 36" along the length of the two strips of media, where the stays are longest and shortest.

In FIGURES 5 and 6 the mechanism for providing the rise and fall of guides 78 and 80 is shown more in detail. The gearing 121 driven from shaft 20, by the sprocket and chain drive 127 comprises a speed reducer 250 having two output gears 252 and 254 of differing diameters. A shaft 256 journalled as at 257 having a symmetrical constant rise and fall cam 258 has splined thereon gears 260 and 262 which are adapted to be selectively engaged with their respective gears 252 and 254, by manual shifting of the gears on the shaft 256, as by a shifter fork 264, and shifter fork rod 266, slidably supported in a sleeve 268, having a lock 270, to hold either one of the gears 260 or 262 in engagement with the gear 252, or the gear 254. The cam 258 actuates a cam follower 272 affixed to a rock shaft 274, journalled in spaced bearings, one of which is shown at 276. The opposite ends of the rock shaft 274 have cranks, one of which is shown at 278.

Each crank 278, is connected by a link 280 to a lift rod 282, slidably mounted in guide blocks 284 and 286 affixed to the plate 154 affixed to the transverse angle iron 150 (see FIGURE 1). The upper ends of the rods 282, are affixed to a block 288, which is welded or otherwise secured to their respective elevating plates 172, disposed at opposite sides of the apparatus. It will be understood that each lift or elevating plate 172 is provided with a block 288 and a lift rod 282 actuated by one of the two cranks 264 at opposite ends of the rock shaft 274, although only one such lift rod, guide blocks 284 and 286, and plate 154 has been illustrated.

The ratio of the gears 252 and 260, and gears 254 and 262, and the speed reducer operate to cause the media 74 to rise and fall once upon the passage of a selected length of media strips through the stitcher. For example, gears 252 and 260, when enmeshed, may cause the rise and fall of the media 74 upon the passage of 6 feet of media, whereby to produce material for two pockets of 36" depth, whereas gears 254 and 262 when enmeshed may effect rise and fall at a faster rate, such as on the passage of four feet of media, to produce two pockets of 24" depth. While a constant rise and fall cam has been referred to, such cam may be varied so that the stitch stays do not graduate uniformly in length, should there be an advantage in non-linear variation of the stitch stay lengths. The cam however will be preferably symmetrical, if each two successive pocket sections are to have like characteristics, in respect to the varying length of the stays.

The cut sections of stay stitched filter media, which may be 24" in length, or 36", or such length as the apparatus is set for, may be trimmed along their side edges 300 and 302, and the side edges and the cut end 304 adjacent the short stays, may then be bound by overedge stitching and a safety stitch, or a tape 306 folded over the edges and stitched, or otherwise secured to the two sections of media, to produce a pocket as generally indicated in FIGURE 3. Such pocket has an elongate rectangular opening at the end left open as at 308. The flanks 310 and 312 when inflated by airflow into the pocket, as indicated at arrow A, take the form of converging planes, by reason of the stays 314 of progressively decreasing length. The opening 308 is affixed to an elongate frame, and a plurality of such frames and pockets, are then arranged side by side in a larger frame, in the manner referred to in the Bauder-Hart application #192,238.

The slight pressure of the tape applying guides 210 tends to press the two strips 74 and 68 of media toward each other, particularly when the strips are spread, as when effecting the stitches with the longer stays. The stays thus may be caused to buckle temporarily, but failing to buckle, the lines of stitching along the top or bottom may become loose just at the time the tapes with the adhesive sealant are applied. While the thread is flexible, and readily tends to buckle, so that lines of stitches do not necessarily loosen, provision may be made to maintain the stays taut, by resiliently looping or buckling the stays to take up the slack.

For this purpose the guide plate 72 may have pairs of wire loops 400 and 402 projecting therefrom in the direction of movement of the material, to engage the thread stays and to form a loop of the slack of each stay. In FIGURES 7, 8 and 9, there is shown a pair of wire loops 400 and 402, which extend between the media, into the region of tape application, where the loops cross as at 404. The loop 400 lies on a vertical plane, while the loop 402 lies on a horizontal plane and extends through the loop 400, Both loops 400 and 402 are of spring wire, such as stainless steel, and readily yield. However, as each stay 314 approaches the region of tape application it is caused to loop laterally as at 410 into the loop 400, over the wire 403 of loop 402, to take up the slack, and create a degree of tension in the stay to draw the lines of stitching on the outside of the media against the media. Once the loop 410 has been formed, whatever stiffness there may have been in the stay no longer tends to loosen the stitching on the outside of the media, since the column effect of the stay which might lift or loosen the lines of stitching on the outer surface of the media has been eliminated by the loop 410 formed in the stays. Thus whether the tapes are applied immediately over the crossover point 404 of the wire loop 400 and 402, or shortly thereafter, the stays are buckled, and do not tend to loosen the lines of stitching on the outer surfaces. The resiliency of the wire loops 400 and 402 is such as to effect the loop in the longer stays, as well as the short stays, and readily yield to the extent necessary to allow long or short stays to pass.

While chain stitching has been referred to, as is shown in FIGURE 4, such chain stitching comprising the stay portions 314, with their loops 315 extending around the succeeding stitch as formed, other forms of stitching may be used. Where chain stitching is employed, as against

a two thread lock stitch, each looper **83** is individually driven by gears **13** in a looper gear box **158**, all of which are in turn driven from the looper drive shaft **90** driven from the bevel gearing **96**. The loopers, as will be understood rotate in synchronism with each stitch, that is one revolution for each stitch to be formed.

While stitches of ¾" spacing have been referred to, and a variation of graduated spacing from 2" to zero between strips of media, it will be seen that the apparatus can be provided with adjustments such as to provide any stitch pitch, and any rate of travel of the media, in respect to the period of rise and fall of the guide plates **78** and **80**. It will also be understood that if filter media of adequate tensile strength to be drawn through the apparatus be employed the use of a supporting mesh fabric may, if desired be eliminated. It further may be desirable to apply the sealant direct to the media in lines along the rows of stitches to seal the needle apertures, and adhere the threads to the media, without using tapes. However, the use of tapes tends to save adhesive, and provide a neat striped appearance to the finished filter pocket.

While a single modification of the invention has been illustrated and described, it is to be understood that the invention is not limited thereto. As various changes in the construction and arrangement may be made without departing from the spirit of the invention, as will be apparent to those skilled in the art, reference will be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. A machine for fabricating pocket filter units comprising, a frame having a transverse member, means on one side of said frame for supplying two superimposed strips of filter media from supply rolls, traction roll means disposed on the other side of said frame for drawing said superimposed strips of media through the frame, and over said transverse member, a pair of vertically spaced guide plates supported from and above said member through which the lower strip of media may pass, a second pair of vertically spaced guide plates disposed above said first named guide plates through which said second strip of filter media may pass, means for gradually and periodically raising and lowering said second pair of guide plates coordinated with the drive of said traction rolls, whereby to periodically vary the spacing between the superimposed strips of media as the strips progress through the guide means, and means operatively associated with said guide plates for effecting simultaneously a series of laterally spaced rows of stitches between said superimposed strips whereby to form stays of periodically varying length between said strips.

2. A machine for fabricating pocket filter units comprising, a frame having a transverse member, means on one side of said frame for supplying two superimposed strips of filter media from supply rolls, traction roll means disposed on the other side of said frame for drawing said superimposed strips of media through the frame, and over said transverse member, a pair of vertically spaced guide plates supported from and above said member through which the lower strip of media may pass, a second pair of vertically spaced guide plates disposed above said first named guide plates through which said second strip of filter media may pass, means for gradually and periodically raising and lowering said second pair of guide plates coordinated with the drive of said traction rolls, whereby to periodically vary the spacing between the superimposed strips of media as the strips progress through the guide means, means operatively associated with said guide plates for effecting simultaneously a series of laterally spaced rows of stitches between said superimposed strips whereby to form stays of periodically varying length between said strips, and means disposed above and below said superimposed strips of media and on the said other side of said frame for sealing the stitching punctures in said media.

3. A machine for fabricating pocket filter units comprising, a frame having a transverse member, means on one side of said frame for supplying two superimposed strips of filter media from supply rolls, traction roll means disposed on the other side of said frame for drawing said superimposed strips of media through the frame, and over said transverse member, a pair of vertically spaced guide plates supported from and above said member through which the lower strip of media may pass, a second pair of vertically spaced guide plates disposed above said first named guide plates through which said second strip of filter media may pass, means for gradually and periodically raising and lowering said second pair of guide plates coordinated with the drive of said traction rolls, whereby to periodically vary the spacing between the superimposed strips of media as the strips progress through the guide means, means operatively associated with said guide plates for effecting simultaneously a series of laterally spaced rows of stitches between said superimposed strips whereby to form stays of periodically varying length between said strips, and means disposed above and below said superimposed strips of media and on the said other side of said frame for applying a narrow tape with sealant applied thereto to each of said rows of stitches for sealing the stitching punctures in said media.

4. A machine for fabricating pocket filter units comprising, a frame having a transverse member, means on one side of said frame for supplying two superimposed strips of filter media from supply rolls, traction roll means disposed on the other side of said frame for drawing said superimposed strips of media through the frame, and over said transverse member, a pair of vertically spaced guide plates supported from and above said member through which the lower strip of media may pass, a second pair of vertically spaced guide plates disposed above said first named guide plates through which said second strip of filter media may pass, means for gradually and periodically raising and lowering said second pair of guide plates coordinated with the drive of said traction rolls, whereby to periodically vary the spacing between the superimposed strips of media as the strips progress through the guide means, means operatively associated with said guide plates for effecting simultaneously a series of laterally spaced rows of stitches between said superimposed strips whereby to form stays of periodically varying length between said strips, means disposed above and below said superimposed strips of media and on the said other side of said frame for applying a narrow tape with adhesive sealant applied to one side thereof to each of said rows of stitches for sealing the stitching punctures in said media, and means for subjecting said strips and tapes to heat for setting the adhesive sealant.

5. A machine for fabricating pocket filter units comprising a frame having a transverse member, means on one side of said frame for supplying two superimposed strips of filter media from supply rolls, traction roll means disposed on the other side of said frame for drawing said superimposed strips of media through the frame, and over said transverse member, a pair of vertically spaced guide plates supported from and above said member through which the lower strip of media may pass, a second pair of vertically spaced guide plates disposed above said first named guide plates through which said second strip of filter media may pass, means for gradually and periodically raising and lowering said second pair of guide plates coordinated with the drive of said traction rolls, whereby to periodically vary the spacing between the superimposed strips of media as the strips progress through the guide means, means operatively associated with said guide plates for effecting simultaneously a series of laterally spaced rows of stitches between said superimposed strips whereby to form stays of periodically varying length between said strips, means on the other side of said frame, and adjacent said stitching means and disposed above and below said superimposed strips of media for pressing a narrow

tape with adhesive sealant applied thereto to each of said rows of stitches for sealing the stitching punctures in said media, and means between the strips for maintaining said stitch stays taut in the region of said tape pressing means.

6. A machine for fabricating pocket filter units comprising, a frame having a transverse member, means on one side of said frame for supplying two superimposed strips of filter media from supply rolls, traction roll means disposed on the other side of said frame for drawing said superimposed strips of media through the frame, and over said transverse member, a pair of vertically spaced guide plates supported from and above said member through which the lower strip of media may pass, a second pair of vertically spaced guide plates disposed above said first named guide plates through which said second strip of filter media may pass, means for gradually and periodically raising and lowering said second pair of guide plates coordinated with the drive of said traction rolls, whereby to periodically vary the spacing between the superimposed strips of media as the strips progress through the guide means, means operatively associated with said guide plates for effecting simultaneously a series of laterally spaced rows of stitches between said superimposed strips whereby to form stays of periodically varying length between said strips, and means disposed between said last named means and said traction rolls and above and below said superimposed strips of media for applying a narrow tape with adhesive sealant applied to one side thereof to each of said rows of stitches for sealing the stitching puncture in said media, said traction rolls having peripheral grooves aligned with said tapes, whereby to apply traction only to portions of the strips between the tapes, and means for subjecting said strips and tapes to heat for setting the adhesive sealant after passage through said traction rolls.

7. The method of continuously forming lines of stitches along two strips of media having stay portions extending between strips of gradually increasing and decreasing length, which comprises drawing two superimposed strips of filter media from a roll supply at a uniform rate, gradually increasing and decreasing the spacing between said strips in coordination with said rate while supporting each strip in a stitching region, effecting a plurality of rows of stitches through said strips of media at said stitching region whereby to provide stitches having connecting stay portions between strips of gradually increasing and decreasing length, applying narrow tapes with adhesive sealant to the outer surfaces of said strips along each row of stitches to seal the stitching punctures effected in said media and simulaneously maintaining the stays under tension between the strips in the area of said tape application, drawing said strips and tapes through irons to apply the strips, thereafter subjecting the top and bottom surfaces of the strips to heat radiation to set the adhesive, cutting the said strips with the stitches formed therein transversely thereof into rectangular sections, along transverse lines where the stitch stays are longest and shortest, and thereafter binding the side edges and the end edges adjacent the shortest stays of each section together, whereby to form a rectangular filter pocket having an open end adjacent the stays of longest length and a closed end adjacent the stays of shortest length, with rows of stays of graduated length extending between the strip section of gradually decreasing length from the open end to the closed end.

8. The method of continuously forming lines of stitches along two strips of media having stay portions extending between strips of gradually increasing and decreasing lengths, which comprises drawing two superimposed strips of filter media from a roll supply at a uniform rate, gradually increasing and decreasing the spacing between said strips in coordination with said rate while supporting each strip in a stitching region, effecting a plurality of rows of stitches through said strips of media at said stitching region whereby to provide stitches having connecting stay portions between strips of gradually increasing and decreasing length, and thereafter sealing the stitching punctures.

9. The method of continuously forming lines of stitches along two strips of media having stay portions extending between strips of gradually increasing and decreasing lengths, which comprises drawing two superimposed strips of filter media from a roll supply at a uniform rate, gradually increasing and decreasing the spacing between said strips in coordination with said rate while supporting each strip in a stitching region, effecting a plurality of rows of stitches through said strips of media at said stitching region whereby to provide stitches having connecting stay portions between strips of gradually increasing and decreasing length, thereafter sealing the stitching punctures, cutting said strips transversely thereof into rectangular sections, in the region where the stitch stays are longest and shortest, and thereafter binding the side edges and the end edges adjacent the shortest stays of each section together, whereby to form a rectangular filter pocket having an open end adjacent the stays of longest length and a closed end adjacent the stays of shortest length, with rows of stays of length extending between the strip sections of gradually decreasing length from the open end to the closed end.

10. The method of continuously forming lines of stitches along two strips of media having stay portions extending between strips of gradually increasing and decreasing lengths, which comprises drawing two superimposed strips of filter media from a roll supply at a uniform rate, gradually increasing and decreasing the spacing between said strips in coordination with said rate while supporting each strip in a stitching region, effecting a plurality of rows of stitches through said strips of media at said stitching region whereby to provide stitches having connecting stay portions between strips of gradually increasing and decreasing length, thereafter sealing the stitching punctures effected in said media by applying tapes having adhesive sealant along each line of stitches, cutting said strips transversely thereof into rectangular sections, in the region where the stitch stays are longest and shortest, and thereafter binding the side edges and the end edges adjacent the shortest stays of each section together, whereby to form a rectangular filter pocket having an open end adjacent the stays of longest length and a closed end adjacent the stays of shortest length, with rows of stays of graduated length extending between the strip sections of gradually decreasing length from the open end to the closed end.

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