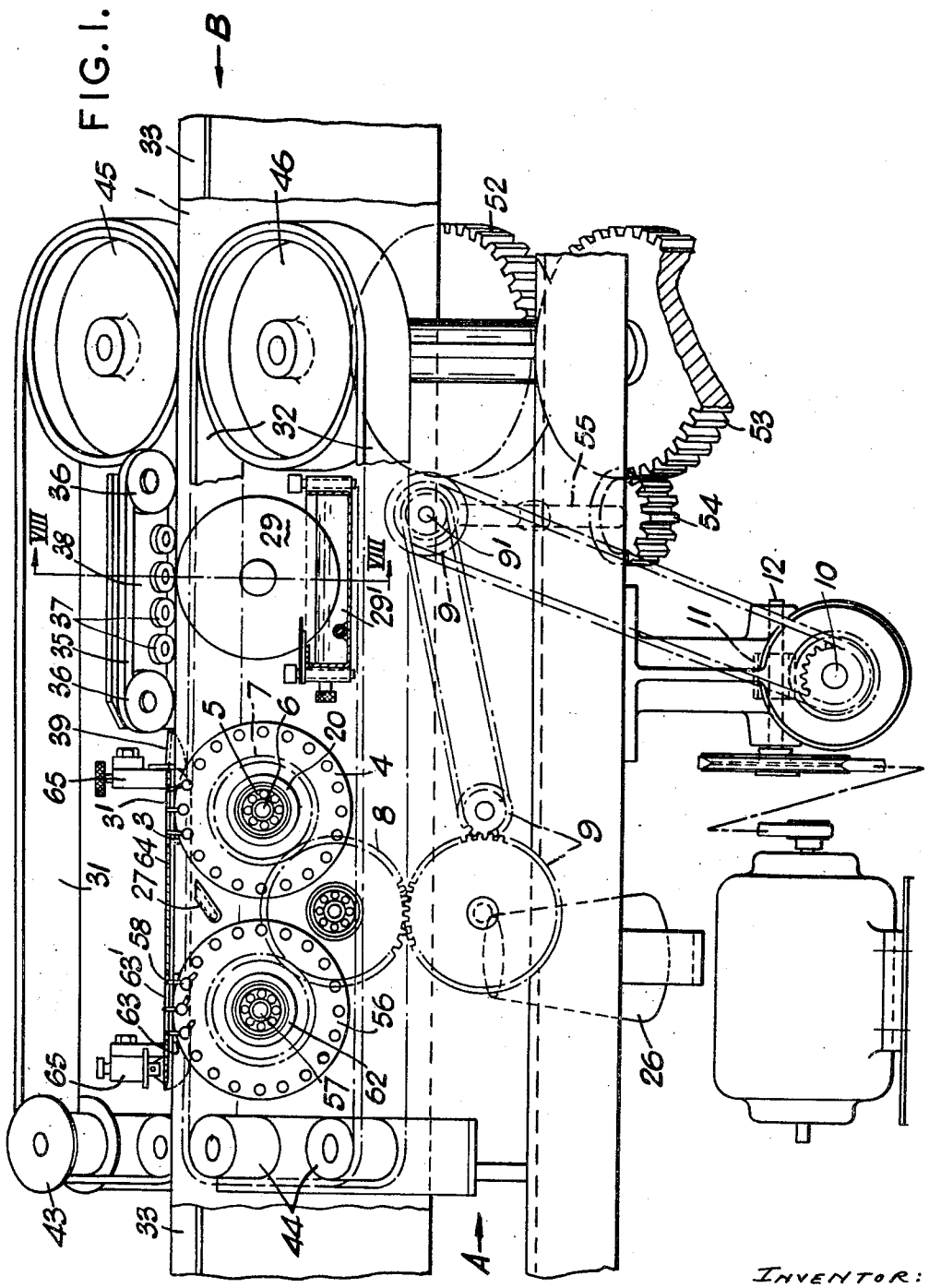
Feb. 13, 1951 A. J. KITCAT 2,541,367

STITCHING MACHINE FOR BOOKBINDING AND LIKE PURPOSES

Filed June 11, 1949 4 Sheets-Sheet 1

FIG. 1.



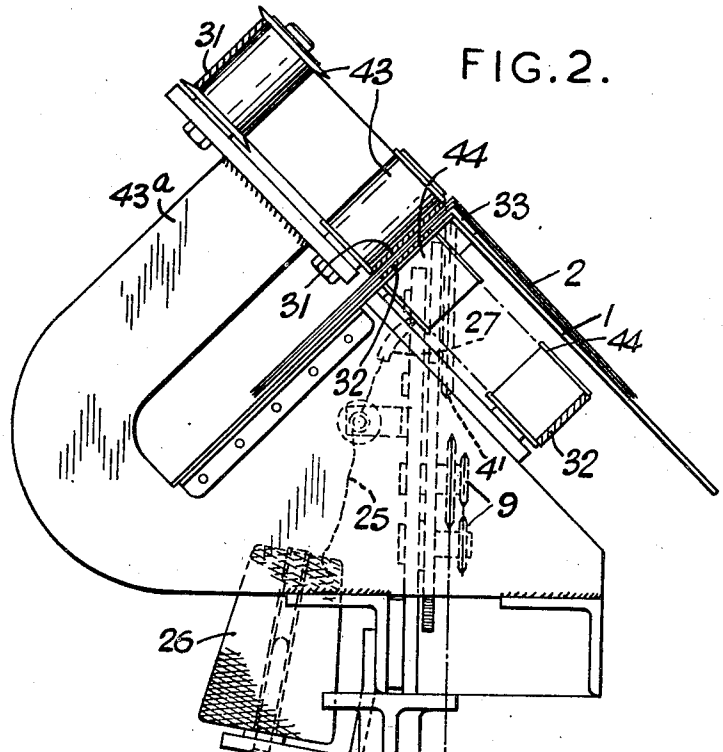
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Feb. 13, 1951 A. J. KITCAT 2,541,367

STITCHING MACHINE FOR BOOKBINDING AND LIKE PURPOSES

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FIG. 2.



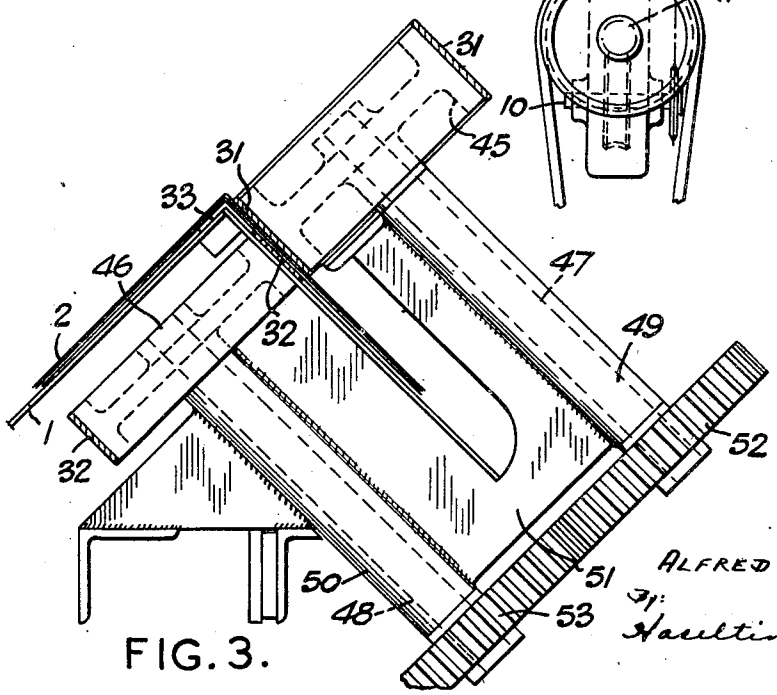


FIG. 3.

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STITCHING MACHINE FOR BOOKBINDING AND LIKE PURPOSES

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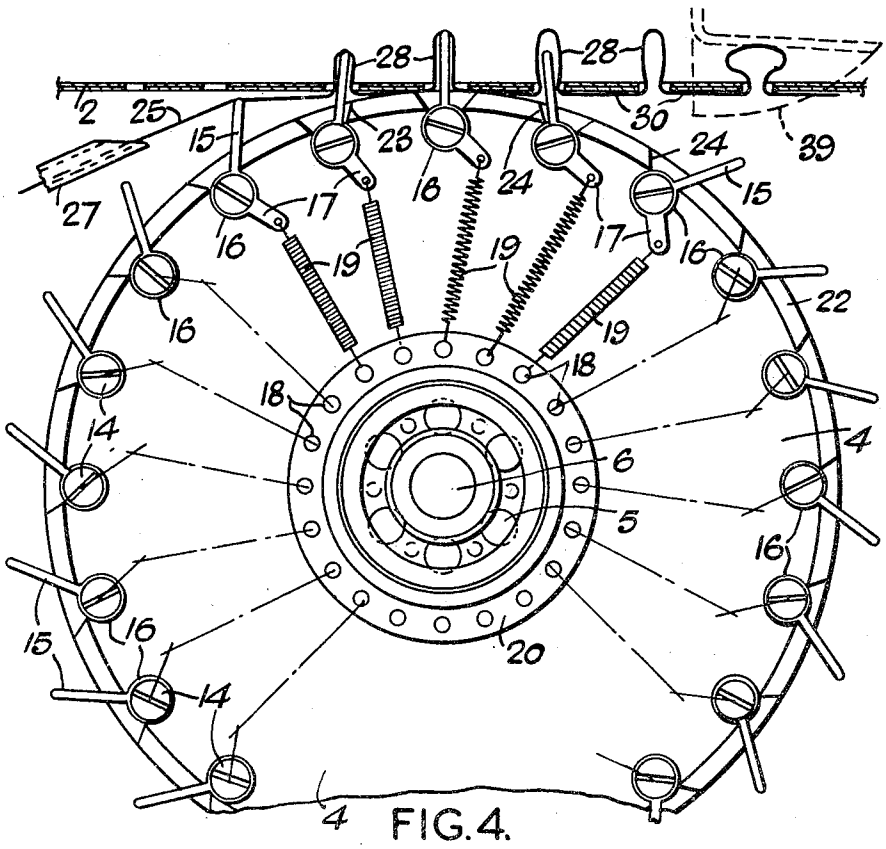


FIG. 4.

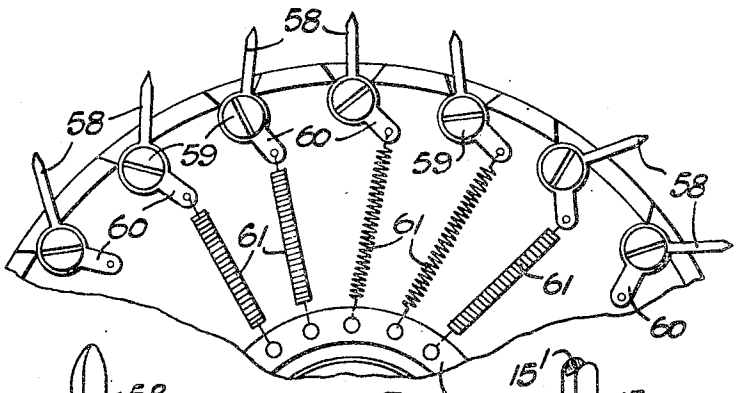


FIG. 5.

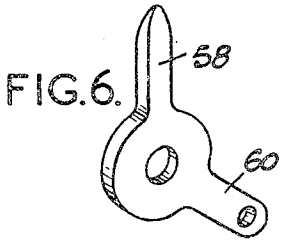


FIG. 6.

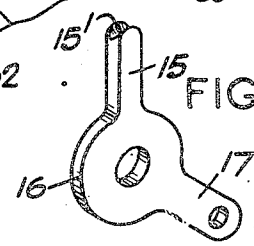


FIG. 7.

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Feb. 13, 1951 A. J. KITCAT 2,541,367

STITCHING MACHINE FOR BOOKBINDING AND LIKE PURPOSES

Filed June 11, 1949 4 Sheets-Sheet 4

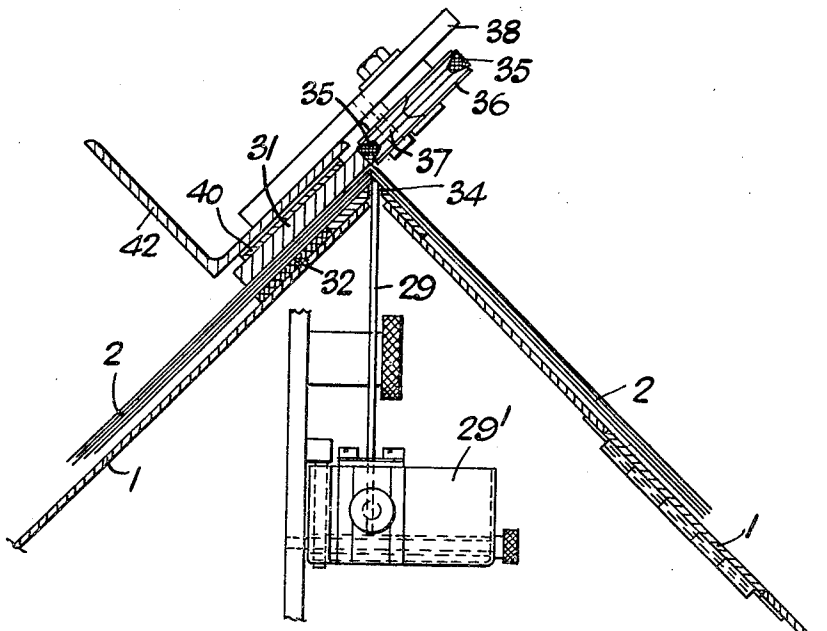


FIG. 8.

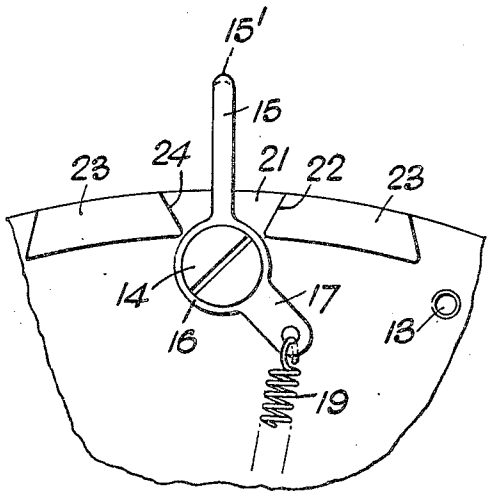


FIG. 9.

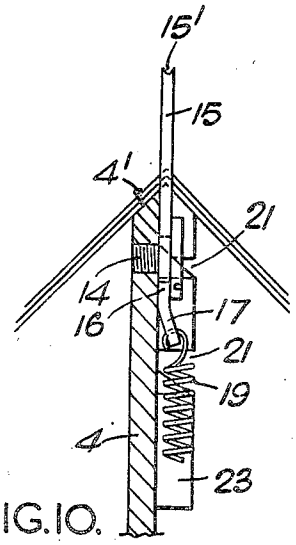


FIG. 10.

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Patented Feb. 13, 1951 2,541,367

UNITED STATES PATENT OFFICE

2,541,367

STITCHING MACHINE FOR BOOKBINDING AND LIKE PURPOSES

Alfred James Kitcat, Somerset West, Cape Province, Union of South Africa

Application June 11, 1949, Serial No. 98,477
In Great Britain July 12, 1948

10 Claims. (Cl. 112—21)

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This invention relates to stitching machines for book-binding and like purpose where e. g. it is required to stitch through the fold or spine of laminated sheets. Existing machines for stitching sheets in book-binding are constructed in a manner which renders their cost of production prohibitive particularly when required for use by printers and book-binders who are not in the position to cater for large scale production. The object of the present invention is to provide a stitching machine, which, as compared with existing machines for stitching books and the like, is cheap to manufacture and simple to maintain in use.

A stitching machine for book-binding and the like according to the present invention is characterised broadly in that the means for passing the stitches through the work comprises a plurality of needles carried by a rotary driven support which brings them successively into a common stitching position and urges them through the work, means being provided to feed the needles with thread or fine gauge wire, and the arrangement being such that all of the needles act upon a common track or length of the thread or fine gauge wire and feed it through the work.

The apparatus according to one form of the present invention is intended for use in the stitching of books, pamphlets or the like, in which the work is partially opened V fashion and fed through the stitching stage so that the longitudinal fold or spine is exposed to the stitching means, and the aforesaid perforators or needles, hereinafter referred to as needles, are arranged as a set equidistantly spaced and projecting beyond the periphery of a circular rotor, such periphery having a cross-section which is substantially complementary with converging inclined surfaces over which the work is guided, the outer extremities of the needles being grooved to engage a suitably tensioned length of thread extending along the plane containing all of the needles, the needles being individually displaceable relatively to the periphery of the disc during each needling or threading operation to compensate for the difference in the generator of movement of each needle relatively to the line of travel of the work.

In order that the invention may be clearly understood and readily carried into effect drawings are appended hereto illustrating an embodiment thereof, and wherein,

Figure 1 is a front elevation view with a portion of a work supporting saddle thereof removed.

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Figure 2 is a view of Figure 1 taken in the direction of the arrow A.

Figure 3 is a view of Figure 1 taken in the direction of the arrow B.

Figure 4 is a broken front elevation view of the needling device.

Figure 5 is a broken front elevation of a device for spiking the work before the needling operation.

Figures 6 and 7 are detail perspective views of a spike and a needle.

Figure 8 is a section on the line VIII—VIII of Figure 1.

Figure 9 is a detail front elevation view showing the locating and angle limiting means with each needle or spike, and

Figure 10 is a vertical section of Figure 9.

Referring to the drawings, an inverted V-shaped saddle 1 is provided for the support of the work 2 whilst the work is being fed through the stitching stage, the ridge or peak of the saddle being provided between its ends with a slot 3 and also being substantially tangential with respect to the periphery of a disc 4 having a central hub carried by bearings 5 on a horizontal shaft 6 disposed transversely with respect to the longitudinal direction of the ridge of the saddle. The disc 4 carries a gear wheel 7 with which meshes a gear wheel 8 driven off power transmission means indicated generally by the reference numeral 9 actuated off a primary shaft 10 driven by worm gearing 11 from an input shaft 12.

The peripheral speed of the disc 4 is substantially identical with the rate of travel of the work 2 along the said saddle. The disc 4 can be a metal casting with a concentric hub for attachment to the shaft 6 and its bearings and at equidistantly spaced intervals near its periphery are provided a plurality of apertures 13 (see Figure 9) receiving pivot pins 14 for a corresponding number of needles 15, each needle having an annular inner end 16 for receiving the appropriate pivot pin, the needles projecting beyond the periphery of the disc for a distance which will enable them to pass through the work 2 fed along the saddle 1. The annular pivoted end of each needle is provided with a crank 17 across which and a cooperating one of a number of apertures 18 in a ring 20 disposed closely about the hub of the disc is connected one of a plurality of coiled tension springs 19. That is to say, the coiled tension springs 19 substantially radiate from the axis of the disc and act upon the needles so as to urge the free ends of the needles towards the periphery of the disc.

The periphery of the disc in the present embodiment, is of V section as at 4' (see Figure 10) so as to be complementary with the ridge part of the inverted V-shaped saddle 1, and on the side of the disc against which are located the needles and associated springs, the corresponding side of the V-shaped periphery of the disc is interrupted by a plurality of gaps 21 in which operate the needles, the arrangement being such that the tension of the springs 19 press the free ends of the needles forwardly relatively to the true radial direction against the trailing end parts 22 (see Figure 10) of the segments 23 of half V section which remain in the outer annular part of the disc after forming the said gaps. The inclination of the needles relative to the said true radial direction may be in the neighbourhood of 30°, and the gaps are dimensioned to provide approximately a swing of 60° to each needle against the influence of its associated spring.

The disc is driven in a direction which results in the needles entering the work in substantially the direction in which they are pointing so that as the disc continues rotating and the work contemporaneously travels forwardly, the resultant drag on the needles 15 as they move forwardly and downwardly away from the work is compensated for by reason of the needles being free to swing rearwardly relatively to the disc 4 until they nearly contact the leading edges 24 of the segments 23 and leave the work, whereupon they will be returned to normal position by reassertion of their springs.

The free end of each needle 15 is notched as at 15' in the direction of the plane through which the needles travel, and the thread 25 is drawn through a guide 27 from the supply spool 26 over the notches of the uppermost needles so that as the needles rise into engagement with the work they carry with them a length of the thread which is forced through the work in a form of a loop. As each needle leaves the work the loop of the thread is left in the work so that each piece of work has threaded therethrough a plurality of loops 28 (see Figure 4) formed from a common length of thread.

One or more rotary gumming discs 29, one being shown by way of example, can be provided beneath the saddle beyond the stitching stage for transferring a thin line of gum from a reservoir 29' to the tensioned parts 30 (see Figure 4) of the thread exposed on the underside of the work 2, i. e. exposed along the interior of the fold of the work, and the work can be assisted through the gumming stage by a pair of endless feed belts 31 and 32 each having a track close to one flank of the saddle for engaging the work, a ridge piece 33 extending along the apex of the saddle 1 to enable the belt 32 to lay co-planar with the inner part of the work adjacent the top of the saddle. A slot 34 is provided along the ridge piece 33 to expose the thread parts 30 to the gumming disc.

In order to ensure obtaining tensioning of the parts 30 of the thread, the looped parts 28 of the thread as they leave the stitching stage are deflected slightly uni-laterally so that in advance of their reaching the gumming stage such loops become gripped between the upper edge of the lower track of the belt 31 (see Figure 8) and the lower track of a V belt 35 guided over end pulleys 36 which, in common with a line of relatively smaller rollers 37 are supported by a plate 38 carried by a convenient part of the machine

frame. The tension and pressure of the lower track of the belt 35 against the opposed edge of the belt 31 tensions the loops 28 to ensure a corresponding tensioning of the parts 30 of the thread, the loops 28 being guided between the upper edge part of the lower track of the belt 31 and the lower track of the V belt 35 by a deflector finger or plate 39 affixed to any convenient part of the machine and having a deflecting face for engaging the loops which bends slightly over the adjacent part of the ridge member 33. The part of the lower track of the belt 31 which cooperates with the V belt 35 is maintained in firm flat relationship with the work so that its upper edge will constantly align with the V belt by means of a resilient plate 40 secured at its ends to an upper horizontal angle bar 42 bridging a pair of end brackets 43a of the machine frame, these end brackets, only one of which is shown in Figure 1, serving at one end to support idler pulleys 43 and 44 for the belts 31 and 32 respectively, these belts being passed over driving drums 45 and 46 respectively carried by shafts 47 and 48 journalled in sleeves 49 and 50 formed as part of a frame member 51. The shafts 47 and 48 are caused to rotate in unison by the mutual engagement of gear wheels 52 and 53 formed thereon respectively. The gear wheel 53 is driven from a pinion 54 on one end of a universally jointed shaft 55 which by any suitable gearing, not shown, receives rotation from a shaft 9' of the transmission 9.

To ensure ease of penetration of the needles 15 through the work so as to avoid excessive strain on the thread it is preferred to perforate the work at the predetermined thread receiving parts before it reaches the needling stage, and for this purpose perforating means operating in synchronism with the needling means is provided in advance of the needling stage. This perforating means comprises a disc 56 rotating on a horizontal shaft 57 and constructed in identically the same manner as the disc 4, this disc 56 carrying a plurality of perforators 58 supported and operated in the same manner as the needles 15, this being apparent by reference to Figure 5 in which it will be seen that the perforators 58 rock on pivot pins 59 and have cranked extensions 60 connected by coiled tension springs 61 to a ring 62. The ridge of the saddle 1 is slotted at 63 to receive the perforators 58, and a guard plate 64 is adjustably secured along the ridge of the saddle by adjustable brackets 65, this guard plate being slotted at 3' and 63' respectively to align with the aforesaid slots 3 and 63 in the ridge of the saddle.

The work is fed abutting end to end along the saddle so as to obtain continuity of operation and a uniform distribution of the lines of apertures formed by the perforators 58 with respect to the ends of each work-piece so that when the work-pieces enter the needling zone the needles 15 will enter freely the preformed apertures for passing the threads therethrough.

Any suitable means may be provided for severing the thread at the discharge end of the saddle, and in fact this may be done manually as likewise may be the feeding of the work along the saddle.

I claim:

1. A stitching machine for book-binding and the like comprising an inverted V-shaped saddle along which is adapted to be passed the work open inverted V fashion, endless belts with opposed work gripping tracks guided along the sad-

dle, a plurality of equidistantly spaced needles mounted upon a common rotary support rotating on a horizontal axis beneath the ridge of the saddle, means pivotally connecting the needles to the said rotary support at a common radial distance from the axis of rotation of said support so that the pointed ends of the needles project beyond the periphery of the said support, an aperture in the said ridge through which the needles pass to engage in the work, a plurality of abutments at the periphery of said support limiting the angle of oscillation of the said needles, spring means urging the said needles about their pivotal support in the direction of rotation of the periphery of the support against some of said abutments, a groove across the free end of each needle extending along the plane of movement of the needles, and means to feed thread to said grooves.

2. A machine according to claim 1, including an adhesive applying rotary member disposed beneath the ridge of the saddle and having an adhesive receiving periphery thereof exposed for engagement with the inner folds of the work and adapted to apply adhesive along the portions of the thread exposed along such inner folds of the work.

3. A machine according to claim 1, wherein the said needles are individually supported by pivot pins passed through a disc rotatable upon a horizontal axis, the outer peripheral part of the disc being formed with a marginal annular portion interrupted at intervals to afford gaps for the reception of the needles, the fore and aft terminal parts of said gaps forming the said abutments for limiting the angle of movement of the needles, the needles having extending inwardly relatively to the periphery of the disc cranks across which and anchorage means disposed towards the centre of the disc are connected coiled tension springs.

4. A machine according to claim 1 including means for perforating the work for the reception of the thread before the work reaches the needling zone.

5. A machine according to claim 4, wherein said perforating means comprises a plurality of perforators mounted upon a rotary support in the same manner as the said needles and having pointed free ends adapted to be forced through the work at the ridge of the saddle.

6. A machine according to claim 5, wherein the said perforators are individually supported by pivot pins passed through a disc rotatable upon a horizontal axis, the outer peripheral part of the disc being formed with a marginal annular portion interrupted at intervals to afford gaps for the reception of the perforators, the fore and aft terminal parts of said gaps forming the said abutments for limiting the angle of movement of the perforators, the perforators having extending inwardly relatively to the periphery of the disc cranks across which and anchorage means disposed towards the centre of the disc are connected coiled tension springs.

7. In a stitching machine for book-binding and like purposes the provision and means for passing stitches through the work and which comprises a plurality of needles a rotary driven support carrying all of said needles which brings them successively into a common stitching position and urges them through the work, means to feed the needles with thread or fine gauge wire, and the arrangement being such that all of the needles act upon a common track or length of the

thread or fine gauge wire and feed it through the work, means adapted to grip and apply tension to the parts of the thread exposed above the work after the work has passed the needling zone so that the parts of the thread exposed along the inner folds of the work are tensioned to lie close along the folds, and means to apply adhesive to said tensioned latter parts of the thread, said thread tensioning means being located so as to be effective on the thread during the application of adhesive to the parts of the thread exposed along the inner folds of the work.

8. A stitching machine for book-binding and the like comprising an inverted V-shaped saddle along which is adapted to be passed the work open inverted V fashion, endless belts with opposed work gripping tracks guided along the saddle, a plurality of equidistantly spaced needles mounted upon a common rotary support rotating on a horizontal axis beneath the ridge of the saddle, means pivotally connecting the needles to the said rotary support at a common radial distance from the axis of rotation of said support so that the pointed ends of the needles project beyond the periphery of the said support, an aperture in the said ridge through which the needles pass to engage in the work, a plurality of abutments at the periphery of said support limiting the angle of oscillation of the said needles, spring means urging the said needles about their pivotal support in the direction of rotation of the periphery of the support against some of said abutments, a groove across the free end of each needle extending along the plane of movement of the needles, means to feed thread to said grooves, means adapted to grip and apply tension to the parts of the thread exposed above the work after the work has passed the needling zone so that the parts of the thread exposed along the inner folds of the work are tensioned to lie close along the folds, and means to apply adhesive to said tensioned latter parts of the thread, said thread tensioning means being located so as to be effective on the thread during the application of adhesive to the parts of the thread exposed along the inner folds of the work.

9. A machine according to claim 8, wherein said tensioning means comprises an endless belt having one track opposed to and engaging the upper edge of the track of the belt engaging the upper part of the work, this engagement of the latter mentioned two belts being effective in close proximity to the ridge of the saddle.

10. In a machine for stitching articles a rotary needle carrying head, means to feed the work substantially tangentially with respect to the periphery of the rotary head, a plurality of needles individually articulated to the head and projecting from the periphery thereof so that for each complete revolution of the head the needles successively penetrate the travelling work, means to feed thread along the work between the rotary head and the work so that as the needles approach the work they successively pick up and then force the thread through the work and as they move away from the work they leave loops of the thread projecting through the work, means maintaining the needles each in a predetermined relatively fixed projecting relationship with the periphery of the head during their movement outside the work stitching zone so that their free ends enter the work approximately perpendicular with respect to the work and means permitting each needle to gradually change its directional

relationship with the head whilst in engagement with the work so as to maintain the needle's substantially perpendicular relationship with the work and returning the needle to said relatively fixed projecting relationship when it leaves the work.

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