United States Patent

Alsop

[15] **3,653,570**

[45] **Apr. 4, 1972**

[54] STITCHING MACHINE

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[73] Assignee: **Strachan and Henshaw Limited,** Bristol, England

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 729,588, May 16, 1968.

[52] **U.S. Cl.** **227/81**

[51] **Int. Cl.** **B27f 7/12**

[58] **Field of Search** 227/81

[56] **References Cited**

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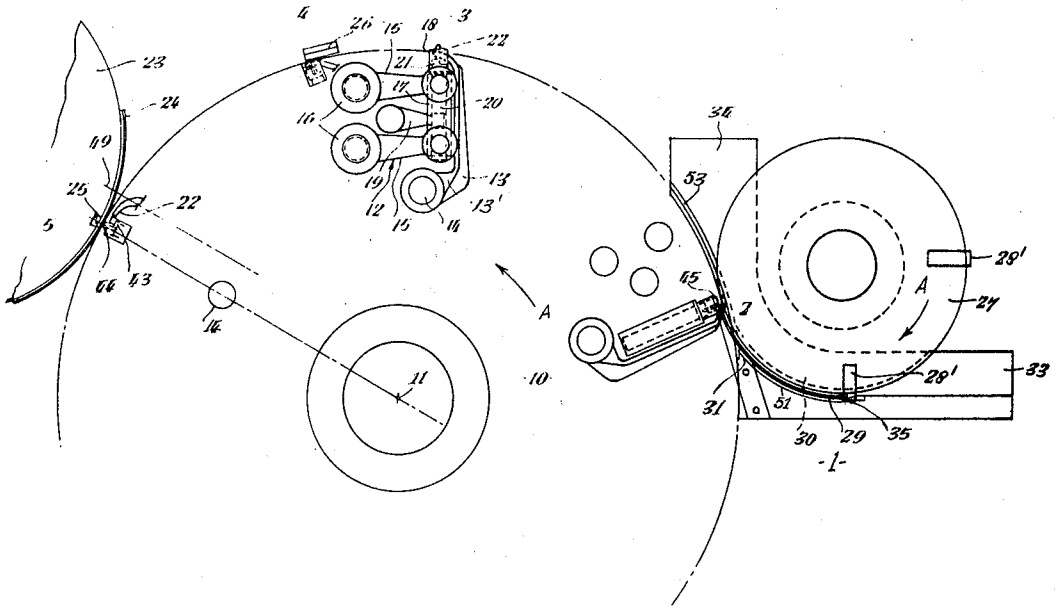
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Primary Examiner—Granville Y. Custer, Jr.
Attorney—Jones and Lockwood

[57] **ABSTRACT**

An axial feed rotary staple stitching machine has a rotating stitching cylinder with stitching heads, each of which includes means for shaping and holding a blank from which a staple is formed, and means for applying the staple against a clinching block, all of which means rotate with the stitching cylinder. The blank is fed tangentially to the stitching cylinder but with its axis parallel to that of the stitching cylinder, by pushers on a delivery cylinder. The machine can exercise a collection function if one or more of the pushers are prevented from acting, without change in the number of stapling heads or collecting stations.

7 Claims, 14 Drawing Figures



Patented April 4, 1972

3,653,570

8 Sheets-Sheet 1

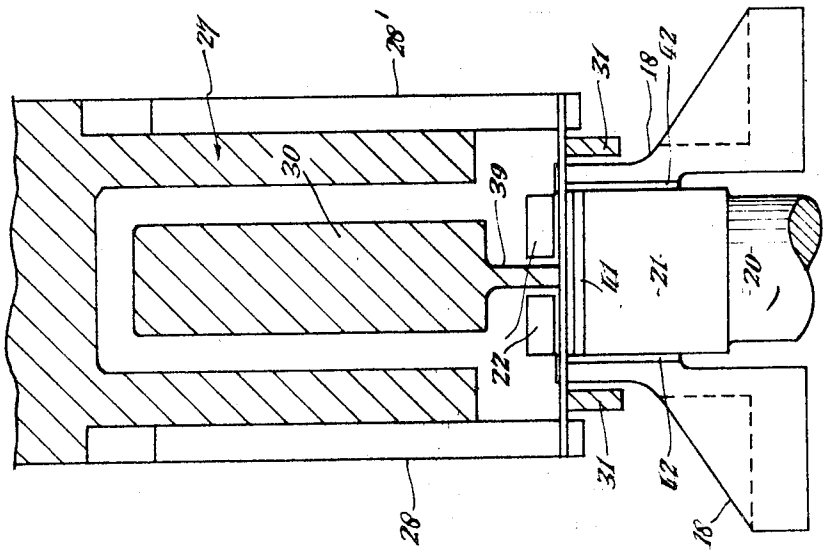


Fig. 2.

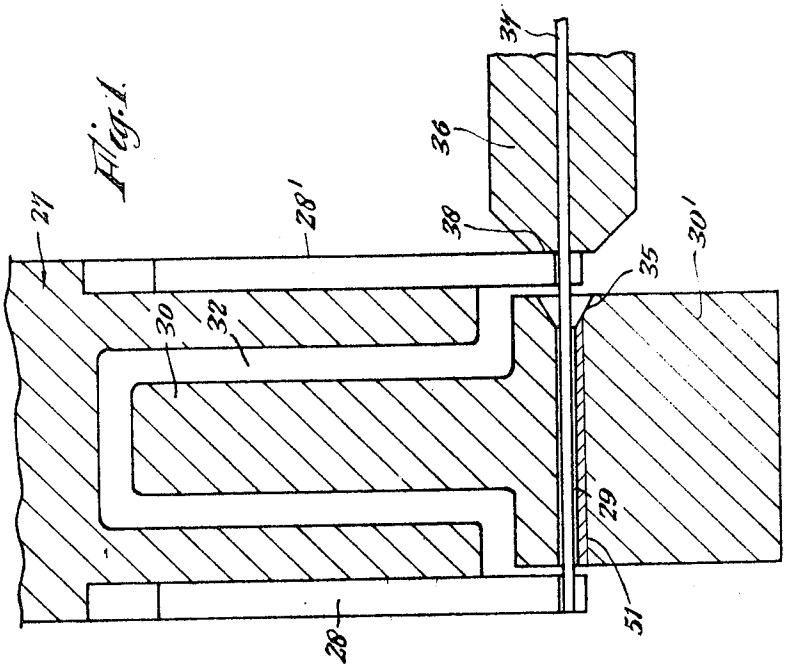


Fig. 1.

Fig. 3.

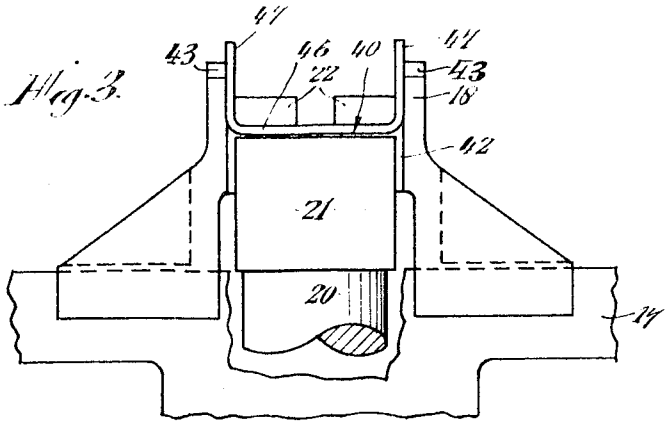


Fig. 4.

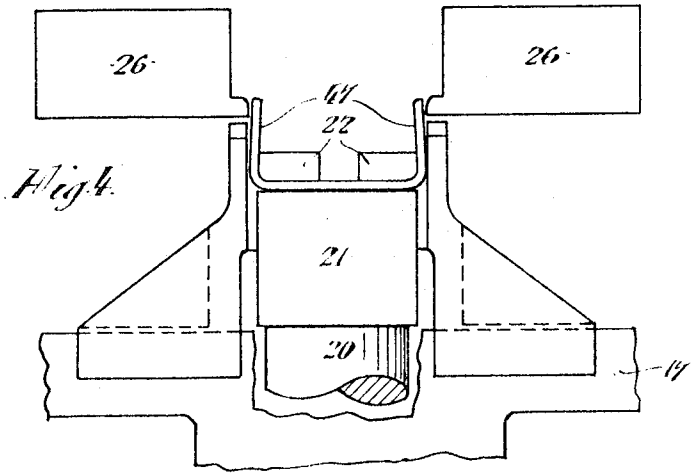
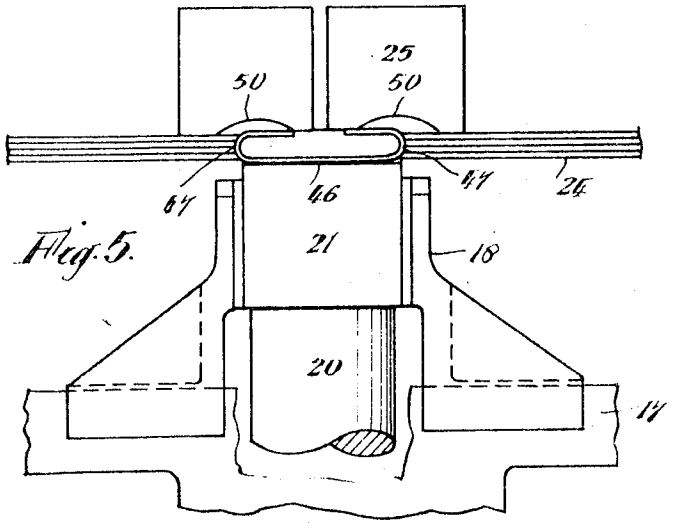


Fig. 5.



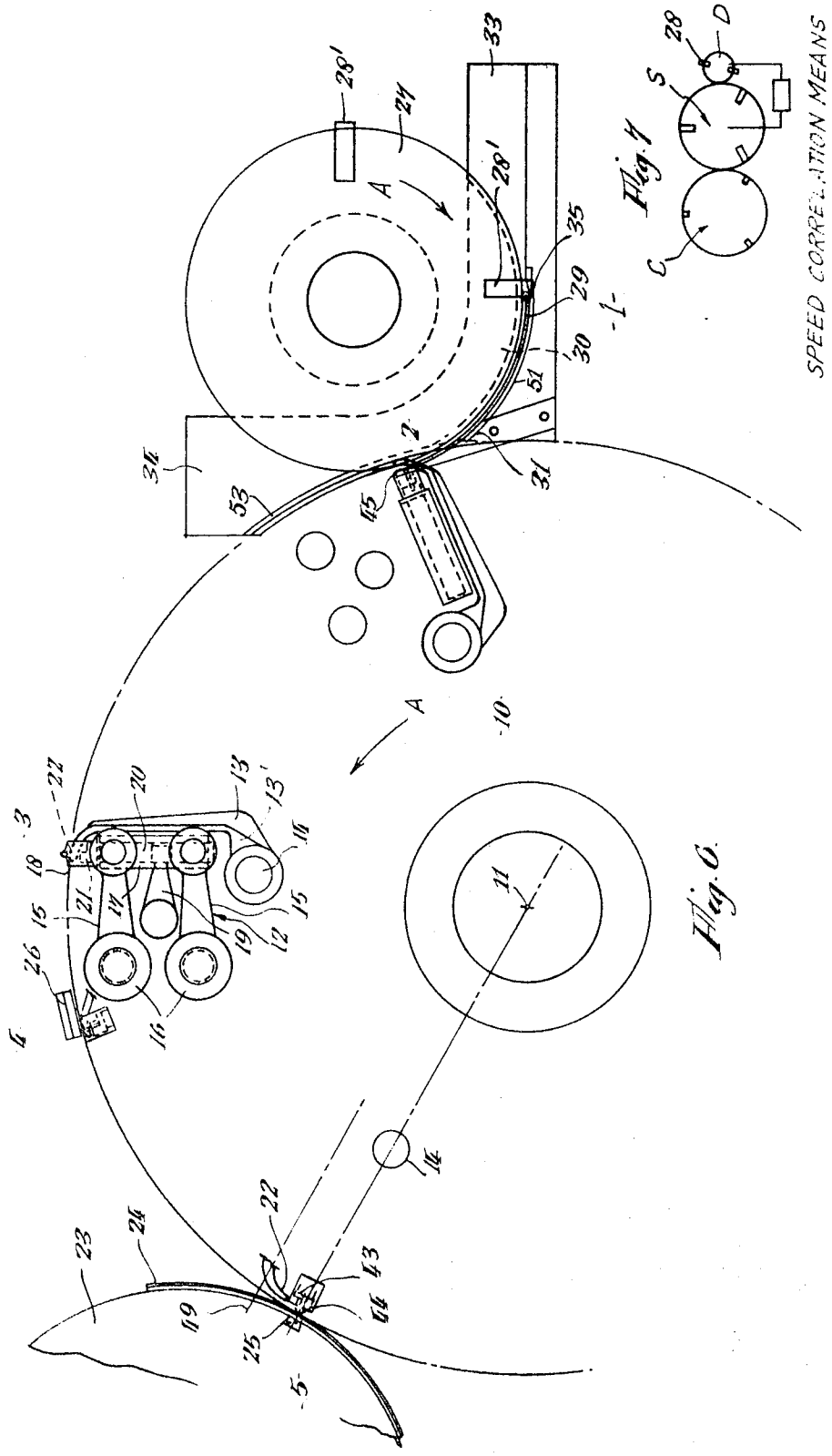


Fig. 4

Fig. 6

Fig. 8.

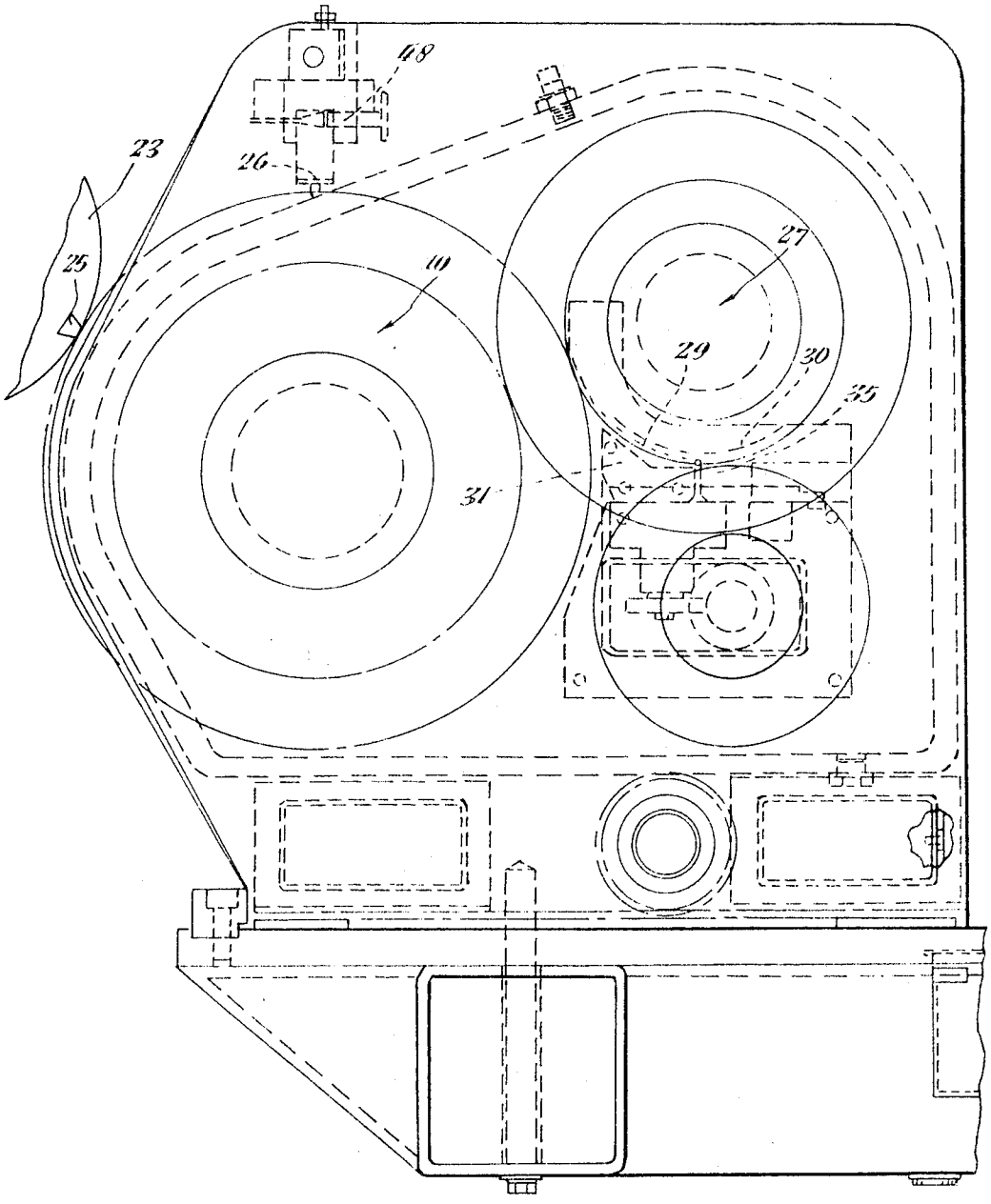


Fig. 9.

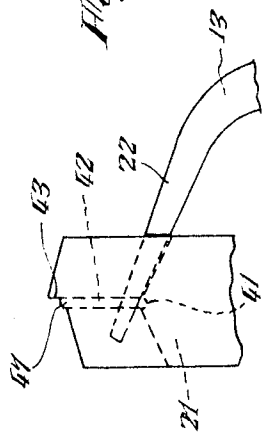


Fig. 14.

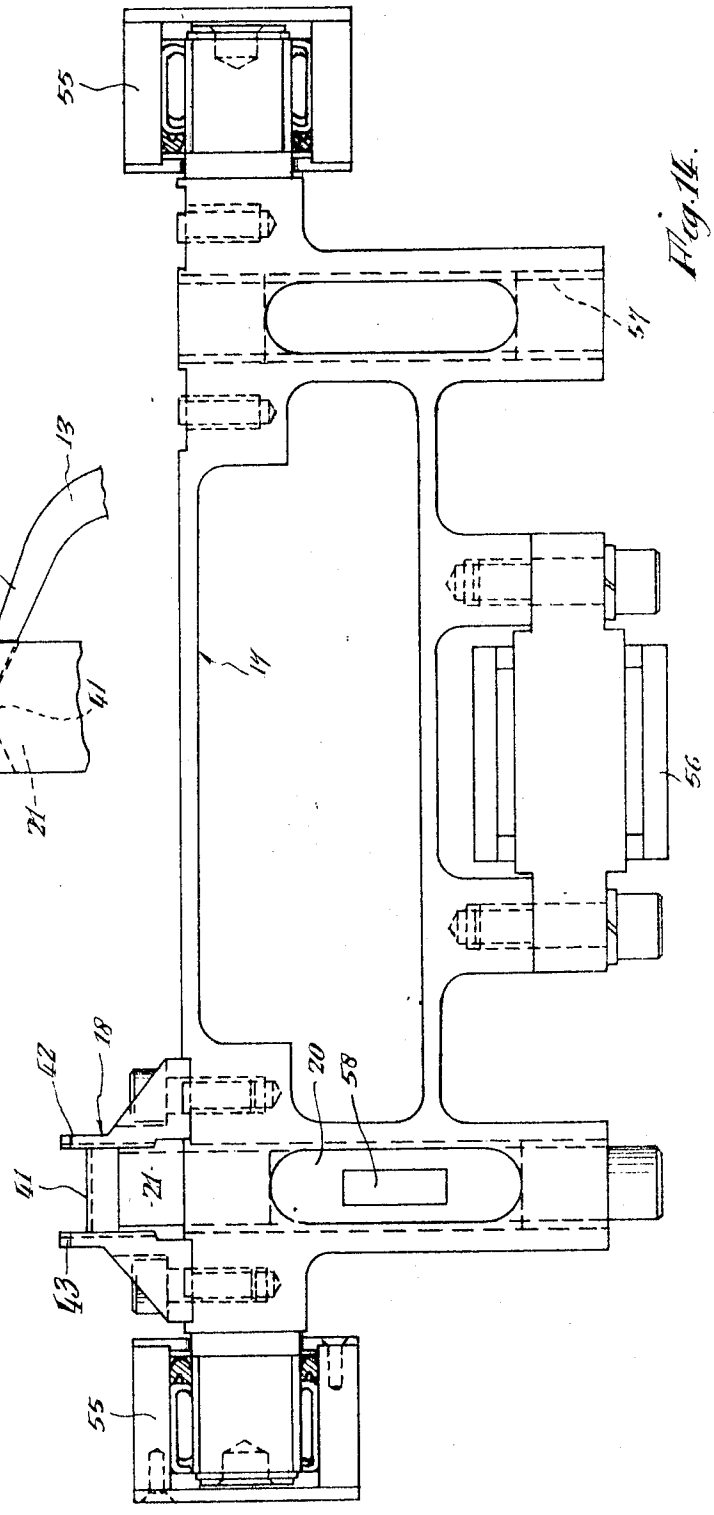
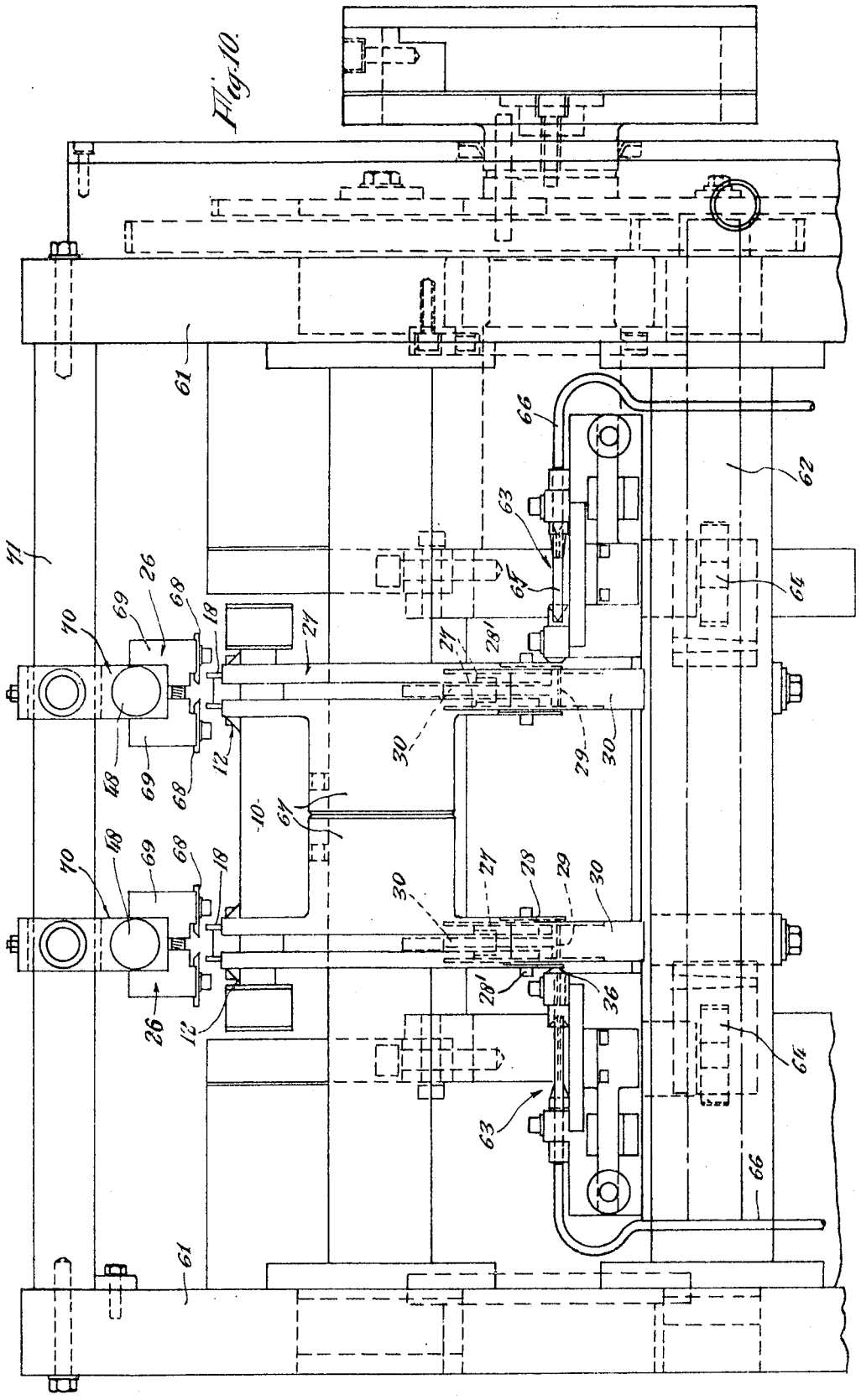


Fig. 10.



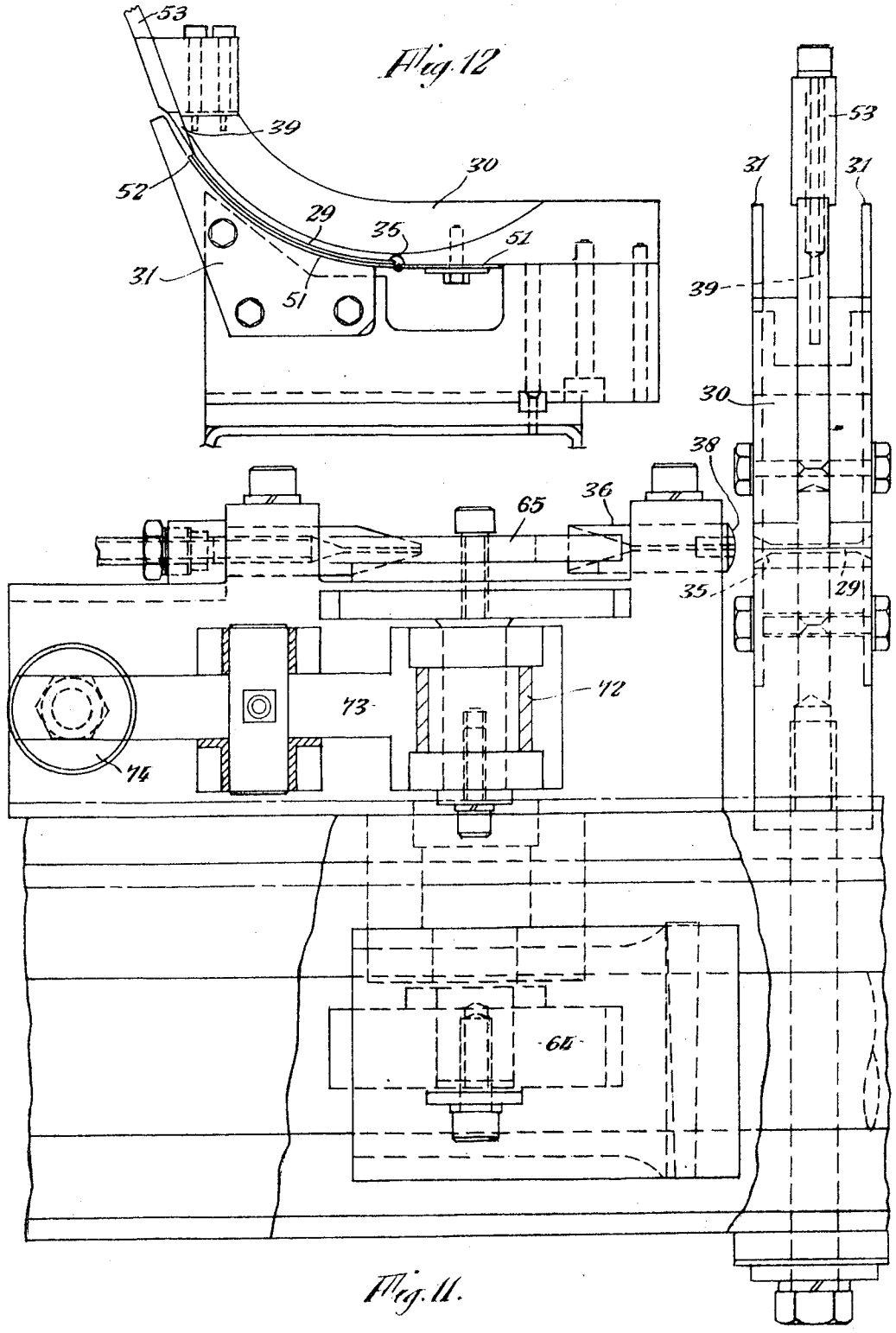
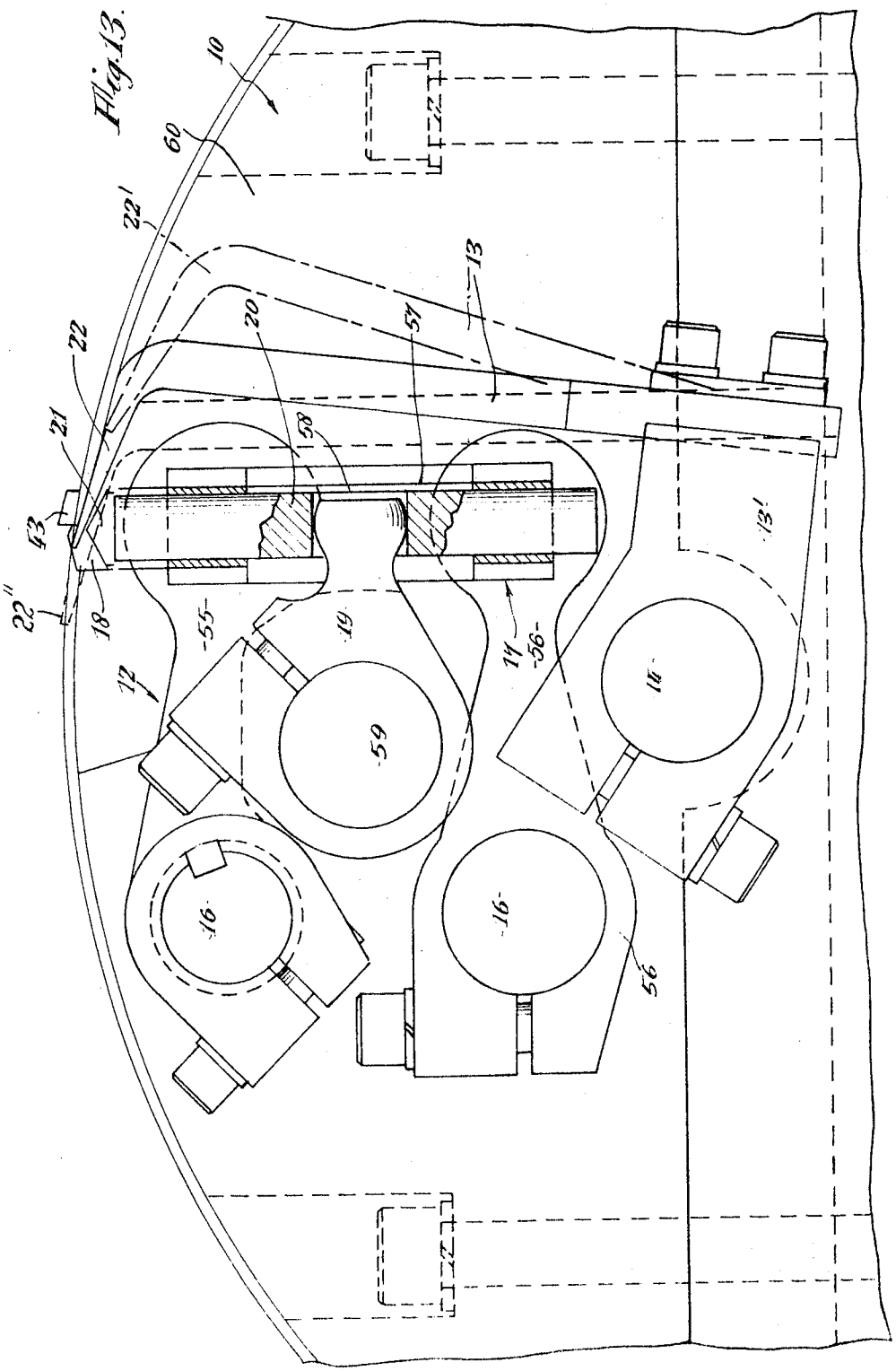


Fig. 12.

Fig. 11.

Fig. 13.



STITCHING MACHINE

CROSS-REFERENCE

This is a continuation-in-part of my co-pending application Ser. No. 729,588, now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to stitching machines of the rotary type. These stitching machines are used for inserting "stitches" in the spine portion of a signature of a book or a magazine. The stitches are in fact formed by the insertion of metal staples into the spine portion.

A rotary machine has a stitch applicator which carries a staple to the signature by rotation of a stitching head about an axis. The head has the dual function of forming a staple from a length of wire and then transferring it into the spine of the signature. The head need not be borne on a complete cylindrical member, e.g., it could be an arm but for convenience the support on which it executes rotary motion will be referred to throughout as a "stitching cylinder."

Conventional designs of rotary stitching machines have design factors which inherently limit the speed at which the machines can be run. In prior machines, the stitching head performs the forming function by pressing the wire blank against a static member called a "forming horn" and, due to a progressively increasing radial overlap between the two, causing distortion of the wire into the characteristic U-shape of a stitch or staple. Thus a rubbing pressure is exerted on the horn and at high speed this pressure results in undesirable effects particularly in the removal of metal from the wire and a build-up of this metal on the horn.

SUMMARY OF THE INVENTION

It is the object of the present invention to provide a stitching machine which avoids this difficulty or diminishes its effect at a given speed.

According to the invention I provide a rotary staple stitching machine for shaping staples from staple forming wire blanks and applying the same to material to be stitched and having a rotatable stitching cylinder with at least one stitching head thereon on which the blank is shaped into a staple, said stitching head having an inside staple former and an outside staple former having a radially stepped redially outer surface, means for feeding the blanks with their lengths disposed parallel to the axis of rotation of the cylinder to be engaged and carried away by the said stepped surface of the outside staple former, means for positioning the inside staple former radially outwardly of the blank to entrap a central part of that blank against radially outward movement during the shaping of the staple and for withdrawing the inside staple former to allow the staple to move radially outwardly into the material to be stitched, means for relatively moving the inside staple former and the outside staple former in the radial direction to form the staple by bending the ends of the blank to form radially outwardly directed staple legs and means for withdrawing the outside staple former in the radially inward direction as the staple enters the material to be stitched whereby the staple legs are supported by the outside staple formers as they begin to enter the material.

Preferably the inside staple former traps the central part of the blank by pressure being exerted radially between itself and a movable staple driver, also on the cylinder, during shaping of a staple, but the blank is radially clear of the inside former and of the anvil at the time it is first caught up with the stitching cylinder.

Another feature which limits the speed at which conventional rotary stitching machines can be run is that the wire blanks are held stationary in a spring loaded jaw and are snatched by the stitching head as it passes the jaw. When the head hits the wire, it has to remove the wire from out of the spring loaded jaw and accelerate it very violently. If the spring loading of the jaw is weak the wire blank may not be held reliably; if it is strong, the wire may be sheared between the side of the jaw and the stitching head.

In one embodiment of the present invention however, I provide a rotary stitching machine in which a blank for a blank is fed to a stitching head on the stitching cylinder by a pusher delivering it along a guideway tangentially to that cylinder when the pusher is moving at a speed not greater than that of the head at the periphery of the stitching cylinder. Preferably the ratio of the speeds of the pusher and of the stitching head is of the order of 1:2, i.e., the speed of the pusher is about half that of the head. Pushers may be mounted upon a cylinder, and there will be preferably one less pusher on the delivery cylinder than there are stitching heads on the stitching cylinder. The guideway along which the pushers move the blank may be the arc of a circle centred on the axis of a cylinder mounting the pushers. A portion of a pusher may act as a knife to cut off a length of wire, to form the blank, from a continuous wire stock fed into the path of the pusher.

BRIEF DESCRIPTION OF THE DRAWINGS

A staple stitching machine forming a particular embodiment of the invention will now be described with reference to the accompanying drawings wherein:

FIGS. **1** to **5** inclusive are diagrammatic radial views and sections on an enlarged scale and at the positions **1** to **5** respectively in FIG. **6**, which is a diagrammatic side view of the embodiment (in which, however, for purposes of illustration singular parts are shown in various positions),

FIG. **7** is a diagrammatic side view of an embodiment which can be used as a collecting and stitching mechanism,

FIG. **8** shows a side view similar to FIG. **6** but showing the necessary support parts of the machine,

FIG. **9** is an enlarged detail of what is shown at position **3**, FIG. **6**,

FIG. **10** is an end view looking from the right hand side of FIG. **8**,

FIG. **11** is a partial view similar to FIG. **10** but with parts of the machine removed for clarity,

FIG. **12** is a detail view similar to FIG. **6** but on a larger scale and of part only of the embodiment,

FIg. **13** is a detail view similar to FIG. **6** in section and on a larger scale, of a stitching head in the embodiment, and

FIG. **14** is a view taken at right angles to FIG. **13**, of part of the stitching head.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring first to FIGS. **6** and **8**, a stitching cylinder **10** rotates in the direction of the arrow A (FIG. **6**) about an axis **11**. It has one or more stitching heads **12** which also have the function of forming a U-shaped staple from a straight wire blank and applying it to material to be stitched to form a stitch in the material. The stitching head consists of a bending former arm **13** mounted on a shaft **14** which runs axially on the cylinder, parallel link arms **15** mounted on common actuated shafts **16** on the cylinder to move a link **17** bearing two outside staple formers **18** (hereafter called ears **18**), see FIGS. **3** and **9**, and an actuating arm **19** which has a head working in a recess in a stem **20** at the head of which is a staple driver (hereafter called anvil **21**).

The arm **13** is to act to entrap a part of the stitch-forming blank from radially outward movement and to this end it is in the shape of a wide and shallow U when viewed as in FIG. **6**, with legs **13'** and **22** at its ends both directed at an angle to the radial direction, with the shaft **14** at one end of the legs **13'**, and the other leg **22** tapering towards its free end and split at that end as will be described. The leg **22** forms an inside staple former.

Beside the stitching cylinder **10** and on a parallel axis is mounted a carrier roll **23** of a folding machine which in combination with the stitching machine can also act, as will be described later, as a collection cylinder. The roll **23** has a clinching block **25** against which staples are to be driven, and the block **25** is at the half length position of a signature **24** of a book or magazine which is carried on the surface of the roll **23**.

Two overbending blocks **26** are provided outside the periphery of the cylinder **6**, and are spaced apart (see FIG. **4**) in the axial direction of the cylinder.

Means for feeding a wire blank tangentially to the stitching cylinder are radially extending, axially spaced apart pushers **28** and **28'** on a delivery cylinder **27**, see FIgS. **6** and **2**. The pushers act to push a blank along a guideway, which is an arcuate guide slot **29**, FIG. **6**, from a position at which the blank is severed from a length of stock, FIG. **1**, to a position where it is snatched by a stitching head, see FIG. **2**. Radially internal and external guides for the blanks are respectively a stationary block **30** and stationary arms **31**, associated with the delivery cylinder **27**. The block **30** has, in a portion of its length, the guide slot **29**, which lies on the arc of a circle centred on the axis of rotation of the cylinder **27**. Where the guide slot ends (between the positions **1** and **2**, FIG. **6**) guidance of the blank radially outwardly of the cylinder **27** is taken up by arms **31** and radially inwardly by a narrow spine **39** on the block **30**.

The construction of this portion of the machine is seen more clearly in FIG. **12**. The guide slot **29** is formed in the block **30** and is bounded on its radially outer side by a strip **51** applied along and between the peripheral faces of the arms **31**. The termination of the guide slot is at position **52**, FIG. **12**, where radially outward guidance of the blanks is taken up by the arms **31**. A nose **53** continuing the spine **39** beyond the position where the blank is snatched up by the stitching head (as will be described later) ensures that the blank has been secured radially inwards by the leg **22** of the forming member **13**.

The construction of the stitching heads is shown more clearly in FIGS. **13** and **14**. The right hand stitching head in FIG. **14** has been removed and is not shown, but is identical to the left hand head. Each stitching head includes, for the formation and insertion at one time of two stitches in a signature one by each head, an anvil **21**, a forming member **13** and an ear **18** and their associated operating parts, the ears **18** and anvils **21** of the two heads being borne however on a common link **17**. The link **17** has axially paired sleeve bearings **57** to receive respectively the stems **20** on which the anvils **21** of the two stitching heads are borne. The stems are movable in unison and relative to the link **17** by the engagement of respective arms **19** on a common shaft **59**. The arms **19** engage apertures **58** in the stems **20**.

The link **17** has two journals, one each axial end, for arms **55** fast with one of the actuating shafts **16**, and a single journal at its axial center for a single arm **56** fast with the other of the actuating shafts **16**.

The ears **18** are bolted to the radially outer face of the link **17** to register with the sleeve bearings **57**.

FIG. **13** shows how the whole of the stitching head is mounted on a segment portion **60** bolted into the cylinder **10** to be removable as a whole for replacement or maintenance. It also shows how the leg **22** is tangentially movable by means of the shaft **14** to be free of the anvil (dotted line position **22'**) or to project fully over the anvil (dotted line position **22''**). The full-line position of the parts is a median situation, found when the head is between positions **4** and **5**, FIG. **6**.

FIG. **10** shows more clearly the nature of the support parts of the machine. Side plates **61** journal the shafts of the cylinders **10** and **27**, and also a drive shaft **62** for axially paired wire feed mechanisms **63**. The wire feed mechanisms are paired rollers **65** and forming a nip in the plane of the paper, the rollers being driven by a worm gear coupling **64** from the shaft **62** through a clutch **72** (FIG. **11**) engageable by a lever **73** operated through cam follower roller **74** from cam means (not shown). Wire is fed from a roll of stock (not shown) for each feed mechanism through guide eyes and guide tubes **66**. By means of these rollers wire is fed through the nozzles **36**. Through the gap between the nozzle **36** and the block **30** (see also FIGS. **1** and **11**) pass the pushers **28'** on the cylinder **27**.

The cylinder **27** is made in two mirror-image halves **67** secured adjustably to its shaft.

The axial registration of the pushers **28, 28'**, with the paired stitching heads is also illustrated by FIG. **10**, although most of the stitching cylinder **10** is obscured in this view.

Adjustment of the overbending blocks **26**, which include knife edge plates **68** mounted on individual bases **69** resiliently mounted on a support **70**, is axially by means of sliding the whole support **70** along an axial rod **71**.

The blocks are adjustable tangentially of the stitching cylinder **10** by Vernier screw adjusters **48** which alter the position of the bases **69** relative to the supports **70**, generally tangentially of the stitching cylinder **10**, so that the position around the axis of rotation of the stitching cylinder **10** at which the blocks **26** act can be adjusted.

The working of the embodiment will be described with reference to FIGS. **1** to **6**.

FIG. **1** shows the interaction of the various parts of the machine at a position where a length of wire for a blank is about to be severed from stock and taken up by the delivery cylinder **27**.

The delivery cylinder **27** has a deep internal peripheral groove **32** into which the stationary block **30** fits. The block **30** projects out at **30'**, see FIG. **1**, of the periphery of the cylinder **27** in order to be secured to the framework of the machine. Suitably this securing is at areas **33, 34** in FIG. **6**.

At one end of the guide slot **29**, FIG. **1**, a flared mouth **35** in block **30** is positioned in line with, but spaced from, the feed nozzle **36** through which wire **37** from the roll of wire stock (not shown) is fed in a direction parallel to the axis of the delivery cylinder **27** and stitching cylinder **10**, by a conventional feed roller arrangement (shown and partly in FIG. **10**).

The amount of wire fed is such that the end remote from the nozzle **36** lies flush with the axially outer face of the remoter of two pusher arms **28, 28'**, paired axially on the cylinder **27**. The pusher arm **28'** acts also as a knife to cut off a length of wire which has been fed. Its side engages in face-to-face contact against a planar end face **38** of the nozzle **36** to shear wire at that position (FIG. **1**). Once the wire has been sheared further rotation of the cylinder **27** causes the blank to be pushed along the arcuate slot **29** in front of the pusher arms **28, 28'**, and a further length of wire to form the next blank to be cut is fed to the mouth **35** and slot **29**. It is to be noted that the distance between the end face **38** of the nozzle **36** and the entrance to the guide slot is kept at a minimum since there is only a single element which has to pass between these two, namely, the pusher arm **28'** which has a function both of a shearing knife and of a pusher. The keeping of this distance to a minimum reduces the chances of error deriving from distortions in the wire.

The contact surface of guide block **30** with the wire blank narrows as it approaches the position shown in FIG. **2** where the blank is about to be snatched by the applicator. The only part of the block **30** then in contact with the wire and guiding it against radially inward movement is a spine **39**, but arms **31** act on an opposite surface of the wire to restrict movement radially outwardly of the cylinder **27**. FIG. **2** shows the position when the applicator is about to snatch the blank **40** from in front of its pusher arms **28, 28'**.

The stitching cylinder **10** is moving at a speed such that its peripheral speed is approximately twice that of the peripheral speed of the delivery cylinder **27**. Thus the applicator **12** overtakes the blank **40** which is being pushed by the pusher arms **28, 28'**. The radial register between the blank and the applicator is arranged to be such that, as shown in FIG. **2**, there is a radial clearance internally of the forming leg **22**, and radially externally of the anvil **21**. The leg **22** is split to interfinger with the spine **39**, and there is a radial clearance between spine **39** and guides **31** which is just enough to permit passage of the blank along them. FIG. **2** also shows that there is an axially directed slot **41** in the head of the anvil **21**.

Driving contact with the wire blank **40** from the applicator **12** derives solely from radially outwardly projecting steps **43** (best seen in position **5**, FIG. **6** and in FIG. **9**) on the ears **18**.

FIG. 2 shows how the ears 18 are paired axially on the stitching cylinder 10 and how they have radially directed slots 42 on their mutually inner faces for receiving upturned legs of a staple, which slots have an open radially inward end.

This is useful because sometimes during bending of the legs they shear off and the accessibility to the part of the slots which they then occupy is valuable in making clearance of this obstruction easier.

As the blank 40 is driven forward by the steps in the ears 18 radially inward support is provided by a shelf 44 which is tangentially directed in front of the step 43. Immediately at the point where drive of the blank 40 by the steps 43 on the ears 18 is established, the arms 31 terminate, at 45, FIG. 6, and the spine 39 of the block 30 although it may continue for some distance as shown in FIG. 6 preferably diverges radially outwardly of the stitching cylinder 10 continuously from the same radius as that containing the end 45 of the arms 31.

Immediately the divergence of the spine 39 has provided enough radial clearance outwardly, the anvil 21 is moved radially outwardly under the influence of its actuating arm 19 and stem 20 so that the part of the blank which is to form the base of the staple is entrapped under pressure between the bending former leg 22 and the anvil 21, and occupies the slot 41. As rotation of the stitching cylinder 10 continues the ears 18 are moved radially outwardly by their arms 15 until when they are at the position shown in FIG. 3, the ears 18 have reached a fully outward position in which a blank 40 has been bent to provide a base part 46 (which has been restrained against radial outward movement by the forming leg 22) and leg forming parts 47 which occupy part of the slot 42 in the ears 18 but project outwardly beyond the periphery of the stitching cylinder.

When there is inherent resilience of the wire material, it is necessary to perform a process known as "overbending" and this is allowed for by the provision of overbending blocks 26 which act on the projecting part of the legs 47 of the staple and urge them together as shown in FIG. 4. It is to be noted that the two blocks 26 are independent entities mounted separately, one each axial side of the applicator. Previous overbending mechanisms have involved the provisions of guides which pressed the top portion of half formed legs into slots in the sides of the forming horn. Thus, they were at an inaccessible part of the machine, could only be adjusted relative to the forming horn by packing in and out and could not be adjusted during a run. The present blocks can be adjusted by means such as 48, FIG. 8, during a run, are in an accessible position and are readily interchangeable with other blocks if, for example, different gauge wires are to be used. The stationary blocks 26 do present the problem that there is frictional contact between the stationary block and the legs 47 which are moving with the stitching cylinder. It may be preferable, in a modification, to use rotating overbending rolls mounted with their axes radial of the axis of the stitching cylinder 10 and with the peripheral part of the rolls projecting mutually inwardly over the top of ears 18.

The fully formed staple 46, 47, is now ready for insertion into the signature 24. At the position marked by a radial line 49, FIG. 6, the free ends of the legs 47 of the stitch begin to enter the outer layer of the signature. These legs are registered with conventional scallops 50 in the base of the clinching block 25 borne on the rotating carrier roll.

As the legs 47 begin to enter the signature 24, the ears 18 are withdrawn by the arms 15 so that their outermost parts follow a path which remains just clear of the periphery of the signature on the roll 23 until, at the position shown in FIG. 5 where the stitch is fully formed, the ears 18 are withdrawn to such an extent the step 43 is radially inwardly clear of the staple. At the same time as the movement of the ears 18, the forming bender leg 22 is moved backwardly by rotation of the shaft 14 so that it is not entrapped by the staple. Also, the anvil 21 moves radially outwardly under the influence of the actuating arm 19 as the bending former leg 22 moves clear, to assist the rolling action on the staple between the stitching cylinder and the carrier roll.

FIG. 5 shows a fully formed staple in which the base 46 is supported by the anvil 21, the ears 18 are radially clear, and the legs 47 have been bent mutually inwardly to form a stitch through the signature 24.

During the remainder of the revolution of the stitching cylinder 10, until it reaches the position of FIG. 2, the various moving parts are brought to the appropriate positions for snatching a blank from the delivery cylinder 27. There can be in principle any desired number of stitching heads on the stitching cylinder and of pushers on the delivery cylinder.

Movements of these parts are throughout controlled by cams associated with the stitching cylinder itself in a manner which per se is well known in the web-handling art.

To summarize the advantageous features of the embodiment which has been described, there is in general great accessibility to the various working parts. More specifically the speed at which cutting off from wire stock occurs is less (approximately half) that of the speed of working of the stitching cylinder and this lessens wear and shocks due to impact. The cutting speed can of course be varied by altering the ratio between the diameters of the stitching cylinder and the delivery cylinder 27.

The position of cut off is close to the entry to the guide, due to the dual function of one of the pushers (there is no separate knife) and the advantage of this has been mentioned.

During formation of the staple from a blank, an anvil and bending formers are used which both are rotationally stationary relative to the wire. This is contrasted with the position where a stationary forming horn is used along and against which a moving blank is urged under a considerable pressure.

The accessibility to the bottom of the slots 42 is advantageous in the case of break-off of the legs 47.

All the staple forming actions occur on the stitching cylinder itself and therefore there is no need for criticality in the clearance as between cylinder and stationary parts.

The overbend blocks are a separate integer in the machine.

All the parts which hold and manipulate the blank during its formation into a staple are mechanically controlled so that the blank is under positive holding control all the time, right up to its final clinching into the stitch.

In a modification the delivery cylinder 27 may be replaced by a feed belt or feed conveyor which guides blanks towards the place where they are to be snatched by the stitching head along a path which need not be an arc of a circle, or if the stitching cylinder is to be run at a comparatively low speed, the stitch blanks could be stationary immediately before being snatched by the stitching head.

A further modification concerns the problems which arise when a stitching cylinder is to be used in conjunction with a collect cylinder. Collecting is the superposition of more than one batch of sheets upon the collect cylinder before stitching. To collect n batches in one signature, one omits to staple at, and to release from, one or more of the collecting stations on that cylinder for $(n-1)$ revolutions of the collect cylinder, and only staples every nth time that station passes the stitching cylinder. In a typical prior arrangement a collect cylinder has three collecting stations and a stitching cylinder has two stitching heads, and the two cylinders would revolve at such a speed that if both stitching heads were working one of them would stitch into each of the collecting stations every revolution. This brings problems regarding the exact registration of the positions of the stitching heads and folding stations (because there are six different combinations of individual collecting stations and stitching heads) and this cannot be resolved merely by making the number of each kind of station equal since there will then be a 1:1 register between any one given stitching station and any one given folding station and there could be no collection. The usual prior solution, in spite of its difficulties, has been to have one less available stitching station than collecting station, to run the two cylinders at appropriate relative speeds of rotation, and if collection is desired to take out of use one of the stitching stations.

The embodiment of the present invention shown in FIG. 7 can overcome this difficulty by adopting this relationship

between the stitching cylinder S and the delivery cylinder D instead of between the collect cylinder C and the stitching cylinder. That is to say in this example both the stitching cylinder and the collect cylinder have three stations each, the delivery cylinder has two stations and these two cylinders are run at appropriately corrected speeds so that when both delivery stations are operating, a blank is delivered to each stitching head as it passes the delivery cylinder. One of the delivery stations can be put out of use in order to get collection on the collect cylinder of two batches to form one signature. This is done simply by removing one pair of the pusher arms **28**, **28'**. The result of this is that each stitching head receives a blank each alternate occasion it passes the delivery cylinder (because the one operative delivery station can only deliver to every other passing stitching head and there are three stitching heads to two delivery stations). Therefore each clinching block on the collecting cylinder receives a staple at every other revolution.

There is low criticality in the registration between the stitching heads and the pushers, and the stitching cylinder and collect cylinder execute a 1:1 movement which is not affected by whether collection is or is not occurring.

However if both pairs of pusher arms are retained, stitches are applied each time a clinching block is at the nip between cylinders C and S.

I claim:

1. A rotary staple stitching machine for shaping staples from staple forming wire blanks and applying the same to material to be stitched and having a rotatable stitching cylinder with at least one stitching head thereon on which the blank is shaped into a staple, said stitching head having an inside staple former and an outside staple former having a radially stepped radially outer surface, means for feeding the blanks with their lengths disposed parallel to the axis of rotation of the cylinder to be engaged and carried away by the said stepped surface of the outside staple former, means for positioning the inside staple former radially outwardly of the blank to entrap a central part of that blank against radially outward movement during the shaping of the staple and for withdrawing the inside staple former to allow the staple to move radially outwardly into the material to be stitched, means for relatively moving the inside staple former and the outside staple former in the radial direction to form the staple by bending the ends of the blank to form radially outwardly directed staple legs and means for withdrawing the outside staple former in the radially inward direction as the staple enters the material to be stitched whereby the staple legs are supported by the outside staple former as they begin to enter the material.

2. Apparatus according to claim **1** wherein the stitching head includes a radially movable staple driver and means to move the driver to trap said central part of the blank between it and the inside staple former during the shaping of the staple, said blank being radially clear of the inside staple former and of the staple driver at the time it is engaged by the outside staple former.

3. Apparatus according to claim **1**, including blank delivery means adjacent said stitching cylinder having a stationary guideway for the blank and pusher means thereon for pushing in front of it a blank for a stitch along the guideway to the stitching cylinder with a motion tangential to the stitching cylinder to be engaged and carried away by a said stitching head thereon at a speed not greater than that of the stitching head at the periphery of the stitching cylinder.

4. Apparatus according to claim **2** in combination with a folding cylinder bearing at least one clinching block thereon in register with the stitching head, wherein means are provided to move the staple driver radially outwardly of the stitching cylinder to move the staple radially outward and press it into the clinching block.

5. Apparatus according to claim **4** wherein the inside staple former is retractable tangentially from the stitch to free the stitch for said movement with the driver.

6. Apparatus according to claim **3**, wherein said blank delivery means adjacent said stitching cylinder is a rotating delivery cylinder having said pusher means mounted thereon, and means to correlate the relative speeds of rotation of said cylinders so that a pusher means registers generally with each stitching head during revolution of the stitching cylinder.

7. Apparatus according to claim **6**, in combination with a carrier roll adjacently operating with said stitching cylinder and carrying the signatures to be stitched, said carrier roll having thereon the same number of clinching blocks for cooperation with the stitching heads as there are stitching heads on the stitching cylinder and wherein there is one less pusher means than stitching heads, and one of the pusher means can be rendered inoperative, whereby the carrier roll can be used to exercise a collect function and acts as a collection roll.

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