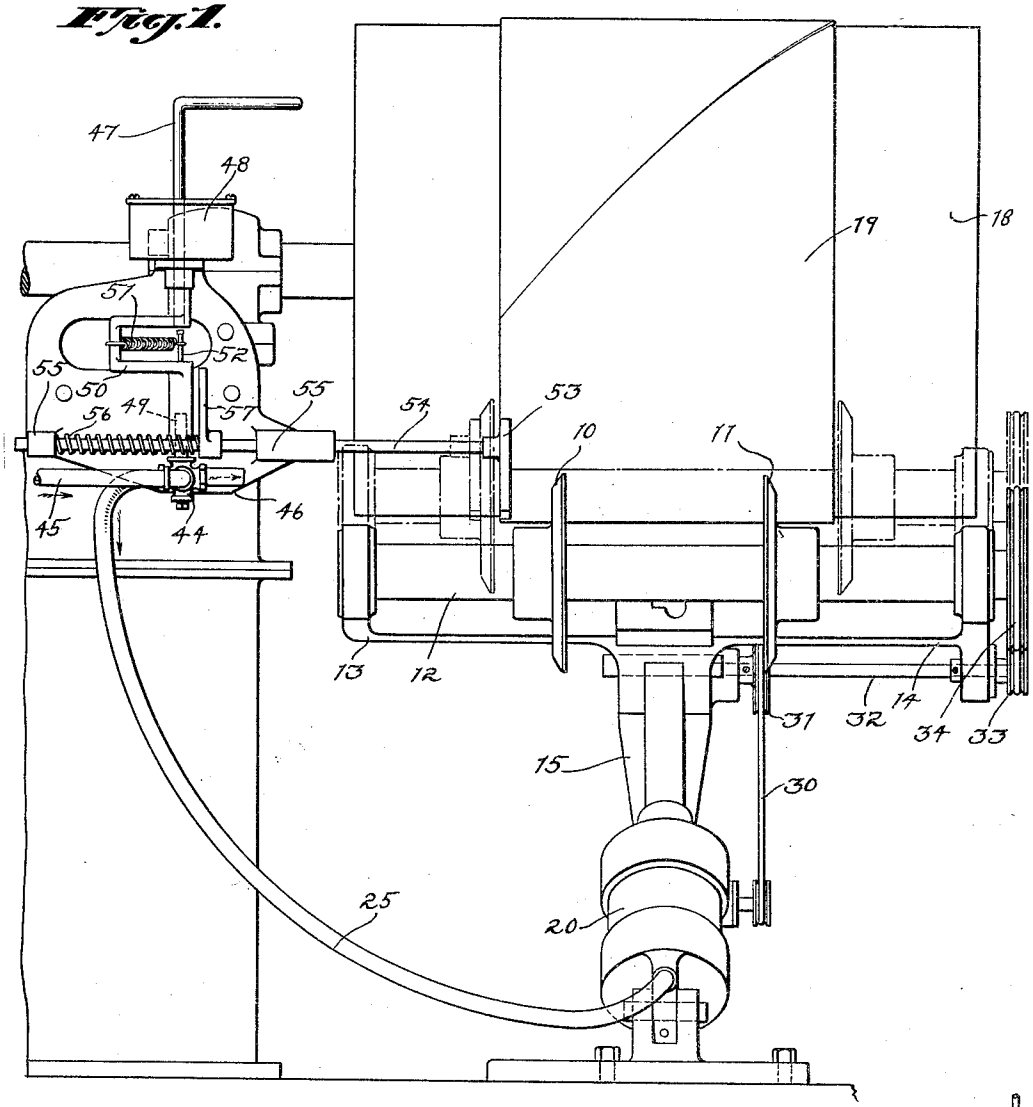
July 5, 1932. F. G. REID ET AL 1,865,540

MOTOR DRIVEN TREAD STITCHER

Filed June 15, 1931 4 Sheets-Sheet 1

Fig. 1.



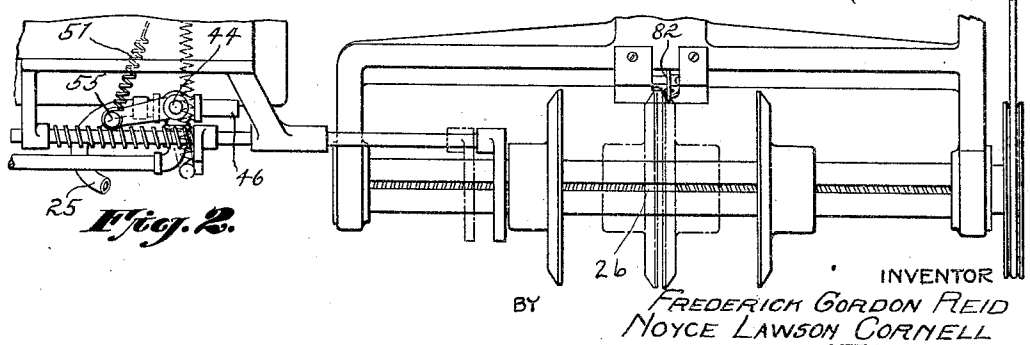


Fig. 2.

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Fig. 3.

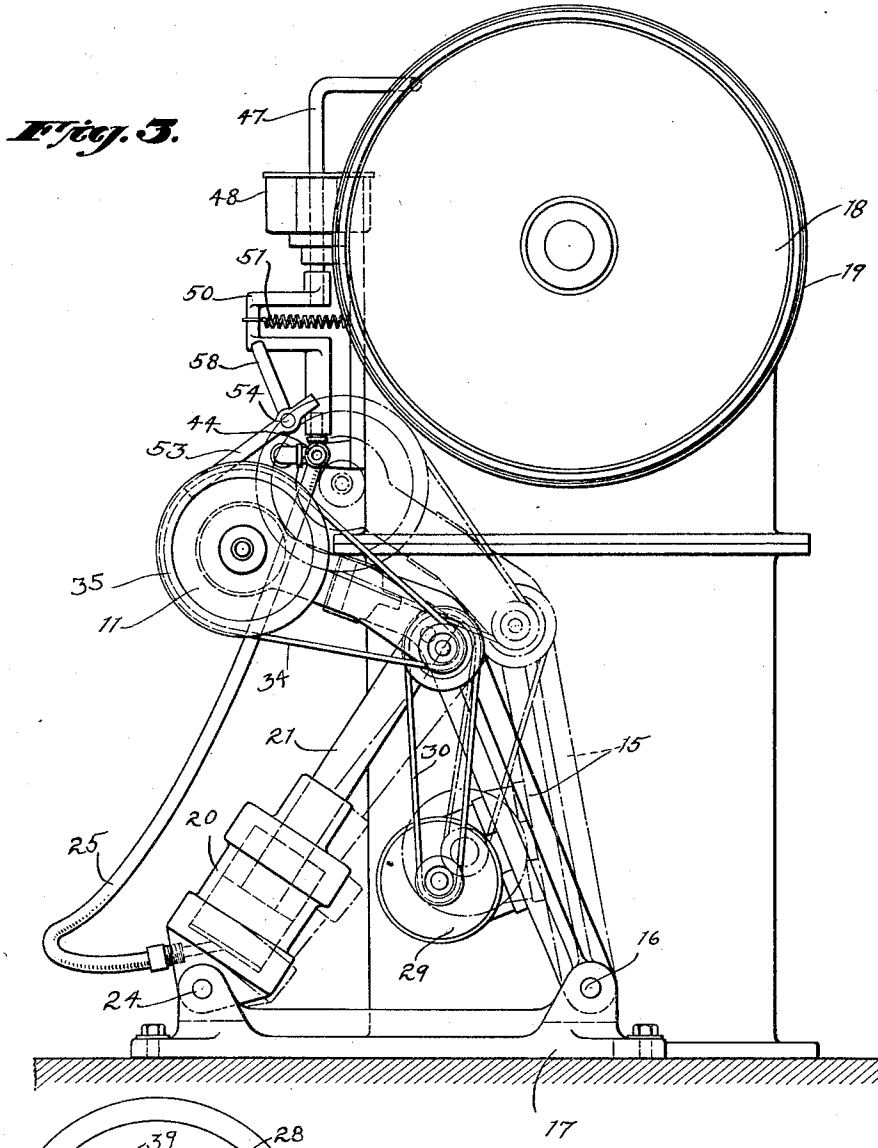
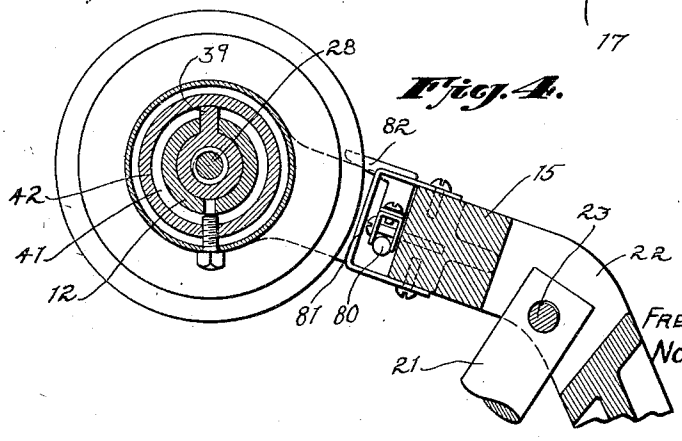


Fig. 4.



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MOTOR DRIVEN TREAD STITCHER

Filed June 15, 1931 4 Sheets-Sheet 3

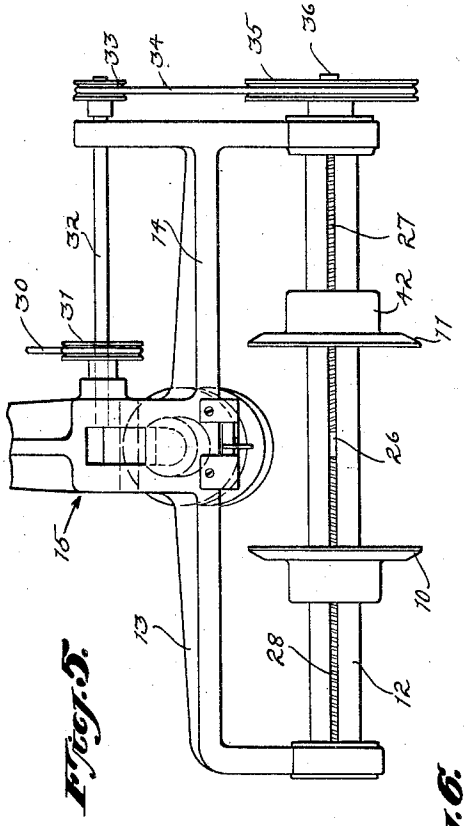

Fig. 5.

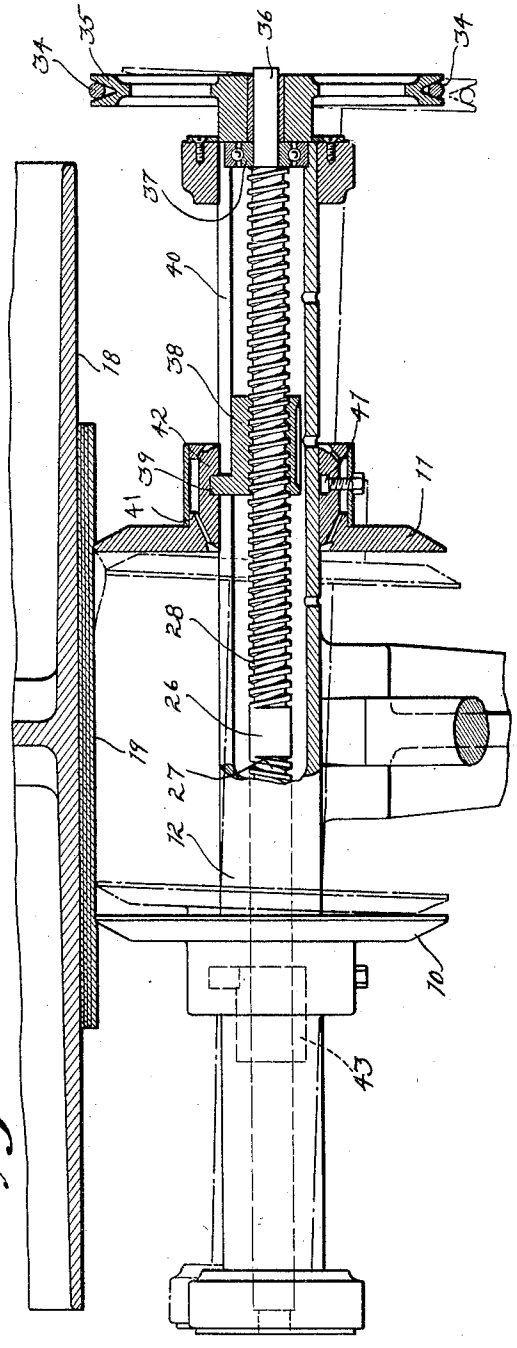

Fig. 6.

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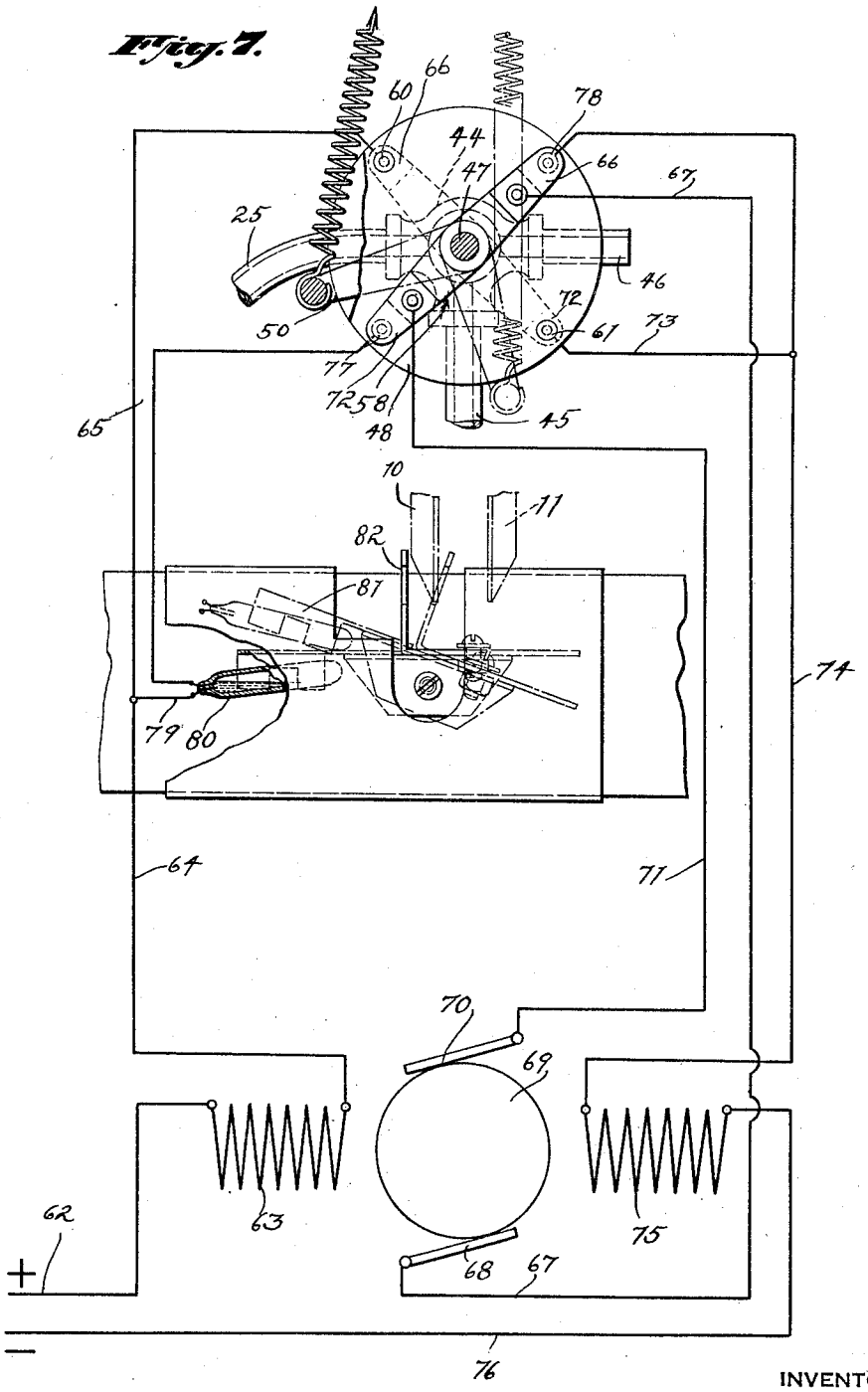
Fig. 7.



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UNITED STATES PATENT OFFICE

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MOTOR DRIVEN TREAD STITCHER

Application filed June 15, 1931. Serial No. 544,336.

Our invention relates to apparatus for uniting or "stitching" layers of fabric and rubber composition into close contact to form a rubber tire structure.

In the stitching or uniting of layers of material for this purpose the various sheets or layers of rubber and fabric are wound onto a rotatable drum. Thereupon the edges of a pair of freely rotatable discs are brought into contact, pressed against the surface of the layers of material on the drum and, as the drum is rotated, the discs are rotated by contact with the material. The discs are slowly separated from each other during this rotation until they reach the side edges of the layers of material, thus completing the uniting or stitching action. The discs are thereupon withdrawn from contact with the drum and brought together to their original position and are thus ready for a second stitching operation.

Objects of the present invention are to provide means whereby the discs will be automatically withdrawn from contact with the surface of the drum or of the material thereon upon the completion of the stitching operation; to provide means whereby the discs will be automatically returned to their original position of contact or proximity as they are removed from contact with the surface of the drum and will be held in readiness for a subsequent stitching operation; to provide means whereby the discs will be pressed uniformly and as a unit against the surface of the material to be stitched but in such a manner as to permit the discs to yield individually when a depression or projection is encountered; and to provide a mounting mechanism for the discs in such a manner that the reacting thrust of the discs against the surface of the drum will be directed to or projected to the area within the supporting base of the stitching mechanism and will thus avoid any tendency to overturn the stitching mechanism by such reacting thrust or pressure.

With these and other objects in view which will be perceived more clearly from the following description, the invention comprises the mechanisms and apparatus described and set forth in the following specification and claims.

The various features of the invention are illustrated in the accompanying drawings, in which—

Fig. 1 is a vertical view of a drum and stitching mechanism taken in a direction at right angles to the axis of the drum and showing the stitching discs in full lines in withdrawn position, and in broken lines in the position they occupy at the completion of the stitching operation.

Fig. 2 is a plan view of the stitching discs and of the supporting and control mechanism therefor, the discs being shown in broken lines in their initial position at the start of the stitching operation, and being shown in full lines as one of them is about to engage and actuate the control mechanism.

Fig. 3 is a side or end view of the drum and stitching mechanism showing in full lines the position of the discs and supporting mechanism in withdrawn position, and in broken lines in stitching position.

Fig. 4 is a detail sectional view taken through the axis of the disc supporting structure.

Fig. 5 is a plan view of the discs and supporting and actuating mechanism.

Fig. 6 is a detail view, partly in section, of the discs and supporting and actuating mechanism showing the discs in normal position in full lines, and showing in dotted lines the position taken by a disc upon meeting a projection in the tire fabric, this position being somewhat exaggerated for the purposes of illustration.

Fig. 7 is a diagrammatic sketch of the control mechanisms and of the electric connections thereto.

Referring to the accompanying drawings, a pair of stitching discs 10 and 11 are rotatably and slidably mounted on a hollow shaft 12 carried between a pair of arms or branches 13 and 14 of a yoke 15. The yoke 15 is pivotally mounted at its lower end 16 on a supporting base 17 so that it may be swung from the position shown in full lines, Fig. 3, to the position shown in broken lines with the discs 10 and 11 in contact with the surface

of a rotating drum 18, upon which is wrapped a layer of rubber composition 19 to be stitched. The yoke 15 is swung on the pivot 16 from the full line to the broken line position of Fig. 3 and pressed toward the drum 18 by means of a fluid operated piston mounted in a cylinder 20 and having a connecting rod 21 extending into a recess 22 in the stem of the yoke 15 and pinned thereto by a pin 23. The lower end of the cylinder 20 is pivotally mounted at 24 on the base 17 so that it may accommodate its position to the movement of the yoke 15 as indicated in Fig. 3. When the discs 10 and 11 are to be moved into contact with the peripheral surface of the drum 18, air is supplied to the lower end of the cylinder 20 through an air pipe 25. The bearing or opening through the lower end of the yoke 15 through which the supporting pivot pin 16 passes is purposely made somewhat larger than the diameter of the pin 16 so that the yoke 15 may rock to a limited extent on an axis longitudinal to the yoke and transverse to the pin 16.

Similarly the connection of the piston rod 21 to the yoke 15 by means of the cross pin 23 is also loose to permit the sidewise rocking of the yoke 15. Consequently, when the yoke is swung toward the drum 18 and presses the edges of the discs 10 and 11 tightly into contact therewith, the position of the yoke 15 is determined by the contact of the discs 10 and 11 with the drum 18 and the yoke will be twisted relative to the supporting pin 16 until the edge of each of the discs 10 and 11 is tightly in contact with the peripheral surface of the drum 18 or of the layers 19 and the discs will be pressed toward the drum 18 with substantially equal pressure. Moreover, should a hard spot or protuberance occur in the layers of material, as indicated in broken lines in Fig. 6, the edge of the disc will bear against this protuberance with the pressure imparted to it through the cylinder 20 but, if lifted outwardly by this protuberance, it does not lift the other disc 10 from the layers of material 19. This is of advantage in that it ensures an equal and uniform stitching pressure against the layers of material at all times during the stitching operation.

As shown particularly in Figs. 3 and 4, the yoke 15 is so shaped that when the discs 10 and 11 are brought against the surface of the drum 18 with considerable pressure, the back thrust from this pressure acts primarily downwardly rather than in a horizontal direction. For example, in Fig. 3 the edge of the discs 10 and 11 are entirely below the projection of the stem of the yoke 15 beyond the pin 23 at which the yoke is bent and when the discs 10 and 11 are brought against the surface of the drum 19 the thrust from the latter is more nearly downwardly to a direction within the pivotal supports 16 and 24 than would be the case if the yoke 15 and its arms or branches 13 and 14 were all in a single plane. There is, therefore, much less tendency for the apparatus to overturn than would be the case if the yoke were straight or in a single plane.

The bent shape of the yoke 15 also has the advantage that when the stitching rollers 10 and 11 are close together as at the start of a stitching operation, and when these rollers are pushed upward against the tire material 19 by pressure from the piston rod 21, the yoke and roll assembly will have an inherent stability due to the fact that a line projected from the pin 16 through the pin 23 falls outside of or to the top of the rollers 10 and 11. Otherwise, if this line fell inside the rollers, then the yoke assembly, due to the loose fits at the points 16 and 23, would be unstable. That is, in the latter case the discs 10 and 11 would have a tendency to rock sidewise to one side or the other on the loose fitting pivot pin 23, whereas with the bent construction shown, the pressure of the drum 18 and of the reaction at the point 16 being applied below, the pivot pin 23 tends to pull the assembly into a stabilized position with the discs 10 and 11 in planes at right angles to the axis of the drum 18.

As soon as the yoke 15 is swung to a position to bring the edges of the discs 10 and 11 against the surface of the drum 18, these discs are rotated on the supporting shaft 12 by their contact with the material 19 or the surface of the drum 18. At the same time they are separated by sliding in opposite directions on the shaft 12. This separation is accomplished by means of a screw shaft 26 mounted within the hollow supporting shaft 12, as indicated in Figs. 5 and 6, and threaded in opposite directions from its center; for example, being provided with left handed threads 27 to the left of the center, and with right handed threads 28 to the right of the center of the screw shaft 26.

The screw shaft 26 is driven from a reversible motor 29 mounted on the yoke 15, as indicated in Fig. 3, through a belt 30, Fig. 1, a pulley 31 and a shaft 32 at the bent part of the yoke 15 and thence through a pulley 33 and belt 34 to a pulley 35 mounted on an end 36 of the screw shaft 26 that projects through the end of the hollow shaft 12. The screw shaft 26 is mounted in bearings 37 within the supporting shaft 12 so as to be rotatable with respect to the latter which is stationary. A nut 38 is threaded on the screw threads 28 of the shaft 26 and is held from rotation by means of a projection or finger 39 that extends through a slit 40 in the hollow shaft 12 and projects into an annular groove 41 in the hub 42 of the disc 11.

From this construction it will be evident that when the screw shaft 26 is driven in one direction by means of the motor 29, the nut 38

slides lengthwise from the central part of the shaft toward one end, carrying with it the disc 11 which is fixed in an axial direction to the nut 38 by means of the projection 39 and annular groove 41, but which permits free rotation of the disc 11. When the direction of the motor 29 is reversed, the rotation of the screw shaft 26 is also reversed and the disc 11 is returned toward the center part of the supporting shaft 12 and screw shaft 26. The disc 10 is similarly provided with a nut 43 threaded onto the screw threads 27 and similarly arranged with respect to the disc 10 so that the movement of the discs is equal and simultaneous from the center of the shaft 12 outwardly and in return.

Means are provided by the present invention automatically to withdraw the discs 10 and 11 from contact with the layers 19 on the drum 18 when they have completed their stitching operation and have reached the extent of separation required therefor, and to thereupon return them to their original position in close proximity or contact so that they are ready for a subsequent stitching operation. The movement of the discs 10 and 11 toward and from the drum 18 is controlled by a three-way valve 44, Figs. 1, 2, 3 and 7 which, when turned in one direction, admits air or other fluid under pressure from a supply pipe 45 to the pipe 25 leading to the cylinder 20 and, when turned in another direction, opens the pipe 25 to an exhaust 46. The valve 44 is moved to connect the supply pipe 45 with the connecting hose or pipe 25 by means of a manually operated handle 47 extending through a control switch 48 and connected to the stem 49 of the valve 44. The stem of the handle 47 is provided with a crank like extension 50 through which it is held in open or closed position by means of a spring 51 connected at one end to the crank 50 and at the opposite end to a pin 52 so that the valve is held either in the communicating position indicated in broken lines in Fig. 7, or in exhaust position indicated in full lines therein, the spring being on opposite sides of the dead center of the crank in these two positions.

When the valve 44 is in its open or communicating position and the discs 10 and 11 reach their outermost stitching position, the disc 10 contacts with and moves to the left a rod 53 carried on a rod 54 slidably mounted in ears 55 on the frame of the machine and urged in the opposite direction, or to the right, by means of a spring 56. As the rod 54 is moved to the left by the disc 10 it carries a projecting arm 57 mounted thereon into engagement with the crank 50 of the handle 47 and swings the latter to the left position shown in full lines in Fig. 7, thereby exhausting the air from the pipe 25 and cylinder 20 and permitting the lever 15 and the discs 10 and 11 to drop away from the drum 18.

When the valve handle 47 and valve 44 are moved to a position to admit compressed air from the pipe 45 through the hose 25 to the cylinder 20, electric current is supplied to the armature and the fields of the motor in such a way as to drive this motor in its forward position, rotating the shafts 36 and screw threads 27 and 28 in a direction to separate the discs 10 and 11.

The wiring arrangements for this purpose are illustrated in Fig. 7. When the lever arm 50 is in the position shown in dotted lines, an oscillating arm 58 of the control switch 48 is in the dotted line position between a pair of diametrically opposite terminals 60 and 61.

Current is thereupon supplied from a main 62 through a field 63 of the reversible motor 29 and thence through a connecting wire 64 and a branch 65 to the terminal 60 and then through a connecting piece 66 of the arm 58 through a wire 67 connected to the latter and leading to a brush 68 of the armature 69 of the motor 29. The current leaves the armature 69 through a brush 70 and a connecting wire 71 leading to a connecting piece 72 of the switch arm 58, which piece is at this time in contact with the terminal 61. Thereupon the current continues its return through a return branch 73 and lead 74 to the opposite field 75 of the motor 29 and thence to the return main 76.

When the control handle 47 is thrown to the full line position of Fig. 7 by the disc 10 and the actuating elements 53—57, connection is broken from the terminals 60 and 61 to the wires 67 and 71, respectively, and connection is formed between the wire 71 and a terminal 77 of the switch 59 and between the wire 67 and the opposite terminal 78. Thereupon current flows from the main 62 through the motor field 63, lead wire 64 and thence through a branch connection 79 and a switch 80, preferably of the mercoid type to the terminal 77, and thence through the connecting plate 72 to the wire 71 and the brush 70.

Current then flows through the armature 69 in a reverse direction to the previous arrangement and leaves through brush 68, connecting wire 67, plate 66 and terminal 78 to the return wire 74, and thence through the field 75 to the main 76.

It will be apparent that the motor is driven in the return direction to bring the discs 10 and 11 toward each other until the switch arm 58 is returned to starting position by manual operation or until the current is broken through the mercoid switch 80.

As it is desirable to stop the motor when the plates are brought together even though the manual switch may not be ready for operation, means are provided automatically to tilt the mercoid switch 80 and break the circuit through the wire 79 when the discs reach

their fully returned position. For this purpose the mercoid switch is mounted on a tilting lever 81 on which is also secured a trip finger 82 so positioned that it is engaged by the return disc 10. For this purpose the mercoid switch 80 and its supporting lever 81 may be mounted on the yoke 15, as indicated in Figs. 2 and 4, in such a position that the trip finger 82 will lie in the path of the disc 10 and be engaged by the latter.

After the discs 10 and 11 have thus been brought to their original position, the motor 29 may be started and run in a forward direction by again swinging the switch handle 47 to the position shown in dotted lines in Fig. 7. This by-passes the mercoid switch 80.

As soon as the discs 10 and 11 have become separated the mercoid switch 80 is permitted to return to its closed position and thus to make the reversing connections for the motor 29 when the switch 48 is reversed.

The present invention, therefore, provides a tire stitching apparatus in which a uniform and equal pressure is applied by the stitching discs under all conditions of operation, and in which the thrust of the discs on the stitching drum or roll and the reaction thereto are in a direction to give great stability and steadiness to the apparatus. Moreover, all of the stitching operations are started and stopped automatically and with exactness.

It will be apparent that the time of reversing the control motor may be controlled by adjusting the position of the rods 53 and finger 57 relative to the switch crank 50 to accommodate the apparatus to wider or narrower layers of material 19.

What we claim is—

1. Apparatus of the type described which comprises a rotatable drum, a pair of rotatable stitching discs, a yoke having a stem and branches and carrying said discs between said branches, and a pivotal support for said stem to permit it to swing toward and from said drum and to turn on the center line of said stem.

2. Apparatus of the type described which comprises a rotatable surface, a pair of rotatable stitching discs, a shaft supporting said discs, a yoke having a stem and branches carrying said supporting shaft between said branches, and a pivotal support for the stem of said yoke to permit said yoke to swing toward and from said drum and to turn on the center line of said stem.

3. Apparatus of the type described which comprises a rotatable surface, a pair of rotatable stitching discs, a shaft supporting said discs, and pivoted supporting means for said shaft to permit said shaft to be moved to or from said supporting surface and to permit it to be tilted to a limited extent on an axis transverse to its length and to the plane of its movement to and from said rotating surface.

4. Apparatus of the type described which comprises a rotatable surface, a supporting shaft in parallel arrangement to said rotating surface, a pair of discs slidably mounted on said shaft, means for carrying said shaft to permit it to be moved to and from said rotating surface, and means to permit said shaft to tilt to a limited extent on an axis transverse to its length and to the plane of its movement to and from said rotating surface.

5. Apparatus of the type described which comprises a drum, a pair of rotatable discs, a yoke carrying said discs to permit their free rotation and axial displacement, a pivotal support for said yoke to permit the edges of said discs to be brought toward the surface of said drum, and means for advancing said yoke towards said drum, said yoke being so proportioned relative to said support and to said advancing means that the thrust of said advancing means on said yoke is received nearer said drum than a line between the point of support and the edge of said disc nearest said drum.

6. Apparatus of the type described which comprises a rotatable drum, a pair of rotatable and axially displaceable discs, a yoke carrying said discs, a pivotal support for said yoke, means for tilting said yoke on said pivotal support to bring the edges of said discs toward or from said drum, said yoke being bent convexly toward said drum at the point of application of the thrust of said tilting means so that the point of application of said tilting means is nearer said drum than a line between the center of said pivotal support and the edges of said discs nearest said drum.

7. Apparatus of the type described which comprises a rotatable drum, a pair of rotatable and axially displaceable discs, a yoke carrying said discs, a pivotal support for said yoke, means for tilting said yoke on said pivotal support to bring the edges of said discs toward or from said drum, said yoke being bent convexly toward said drum at the point of application of the thrust of said tilting means so that the point of application of said tilting means is nearer said drum than a line between the center of said pivotal support and the edges of said discs nearest said drum, said pivotal supporting means of said yoke and the connection of said yoke to said advancing means being sufficiently loose to enable said yoke to tilt to a limited extent on an axis transverse to that of said pivotal supporting means.

8. Apparatus of the type described which comprises a rotatable stitching surface, a pair of rotatable discs, means for mounting said discs so that they may be separated one from the other on their axes of rotation, means for advancing and withdrawing said mounting means toward and from the surface of said drum, electrically driven reversible means for separating and bringing said discs to-

gether, and means actuated automatically to reverse said electric means upon the separation of said discs to a predetermined extent.

9. Apparatus of the type described which comprises a rotatable stitching surface, a pair of rotatable discs, means for mounting said discs so that they may be separated one from the other on their axes of rotation, means for advancing and withdrawing said mounting means toward and from the surface of said drum, electrically driven reversible means for separating and bringing said discs together, means actuated automatically to reverse said electric means upon the separation of said discs to a determined extent and to withdraw said discs from said stitching surface, and means to stop said electric driving means when said discs reach their returned position.

10. Apparatus of the type described which comprises a rotatable drum, a pair of rotatable and separable discs mounted on an axis of rotation parallel to the surface of said drum, means for advancing and withdrawing said mounting means toward and from the surface of said drum, electrically driven reversible means for separating and bringing said discs together, manually operated means for actuating said electrically driven means in separating direction, and means actuated automatically to reverse said electric means upon the separation of said discs to a predetermined extent.

11. Apparatus of the type described which comprises a rotatable drum, a pair of rotatable and separable discs mounted on an axis of rotation parallel to the surface of said drum, means for advancing and withdrawing said mounting means toward and from the surface of said drum, electrically driven reversible means for separating and bringing said discs together, manually operated means for actuating said electrically driven means in separating direction, means actuated automatically to reverse said electric means upon the separation of said discs to a predetermined extent, and means automatically to stop said electric driving means in reverse direction when said discs reach their returned position.

12. Apparatus of the type described which comprises a rotatable stitching drum, a pair of rotatable and separable discs mounted on axes parallel to the surface of said drum, pneumatic means for advancing said discs to and from the surface of said drum, electrically driven means for separating said discs and bringing them together, a valve for controlling said pneumatic means, a switch for controlling said electrically driven means, a common manually operated means for opening said valve and said switch to starting position, and means controlled by the separation of said discs to a predetermined extent to reverse the position of said valve and of said switch.

13. Apparatus of the type described which comprises a rotatable stitching drum, a pair of rotatable and separable discs mounted on axes parallel to the surface of said drum, pneumatic means for advancing said discs to and from the surface of said drum, electrically driven means for separating said discs and bringing them together, a valve for controlling said pneumatic means, a switch for controlling said electrically driven means, a common manually operated means for opening said valve and said switch to starting position, means controlled by the separation of said discs to a predetermined extent to reverse the position of said valve and of said switch, and a switch actuated by the return of said discs to a predetermined position to break the circuit of said electric means in a reverse position.

14. Apparatus of the type described which comprises a rotatable stitching drum, a yoke having a stem and a pair of branches, a supporting shaft mounted between said branches parallel to the surface of said drum, a pair of discs rotatably and slidably mounted on said shaft, pneumatically operated means for swinging said yoke to bring the edges of said discs toward the surface of said drum, a reversible electrically driven screw in said shaft for separating said discs, a reversing switch for said electrically driven means, a reversing valve to control said pneumatically operated means, a manual switch for setting said pneumatic means and said electric means in forward position, means actuated by the separation of said discs to reverse said valve and said switch, and means mounted on said yoke to interrupt said electrically driven means when in reverse direction upon the return of said discs toward each other.

In witness whereof we have hereunto set our hands.

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