Feb. 15, 1944. R. A. SANDBERG 2,341,816

RUBBER STRIPPING MACHINE

Filed May 24, 1943 7 Sheets-Sheet 1

Fig. 1

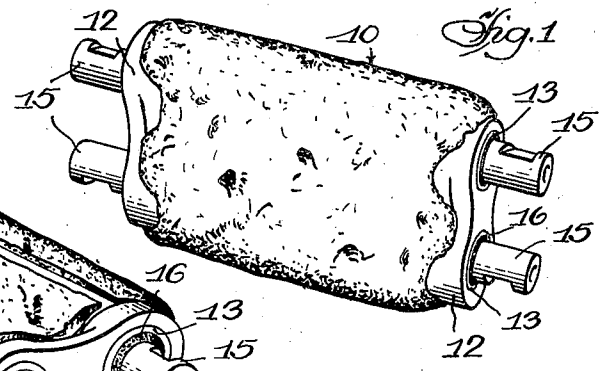
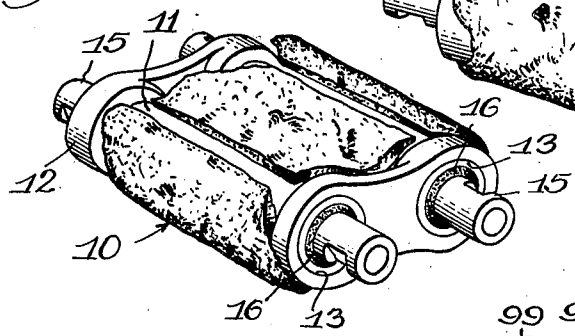



Fig. 2



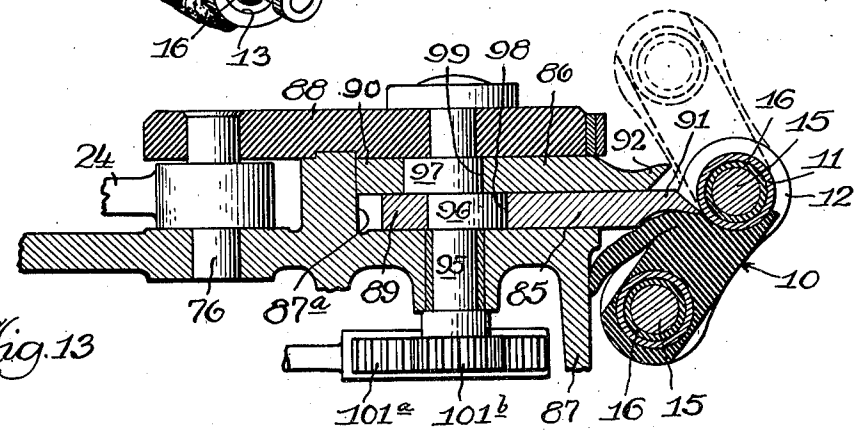




Fig. 13

Fig. 15

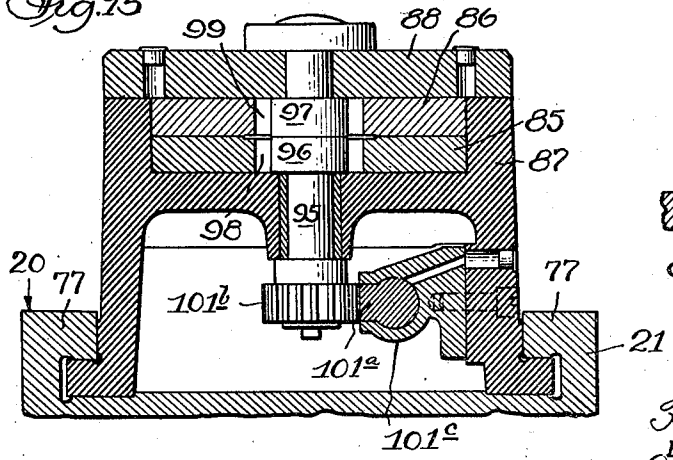
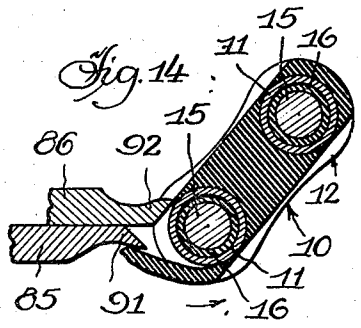



Fig. 14




INVENTOR.
Ray A. Sandberg
BY
Clarence F. Poole
Atty.

Witness:
Chas. R. Kourek

Feb. 15, 1944. R. A. SANDBERG 2,341,816

RUBBER STRIPPING MACHINE

Filed May 24, 1943 7 Sheets-Sheet 2

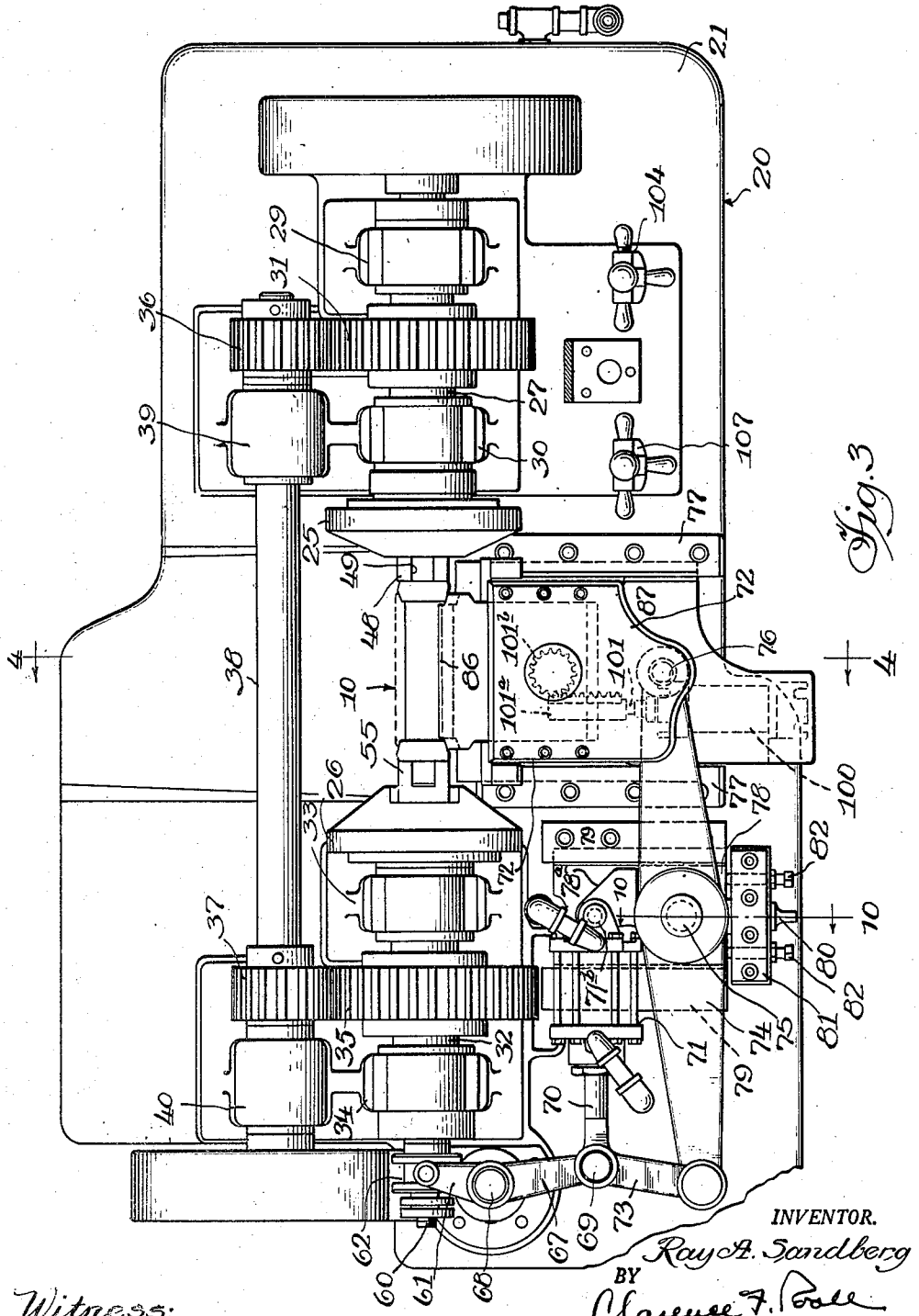



Fig. 3

INVENTOR.
Ray A. Sandberg
BY
Clarence F. Poole
Atty.

Witness:
Chas. R. Kourch

Feb. 15, 1944. R. A. SANDBERG 2,341,816

RUBBER STRIPPING MACHINE

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Fig. 4

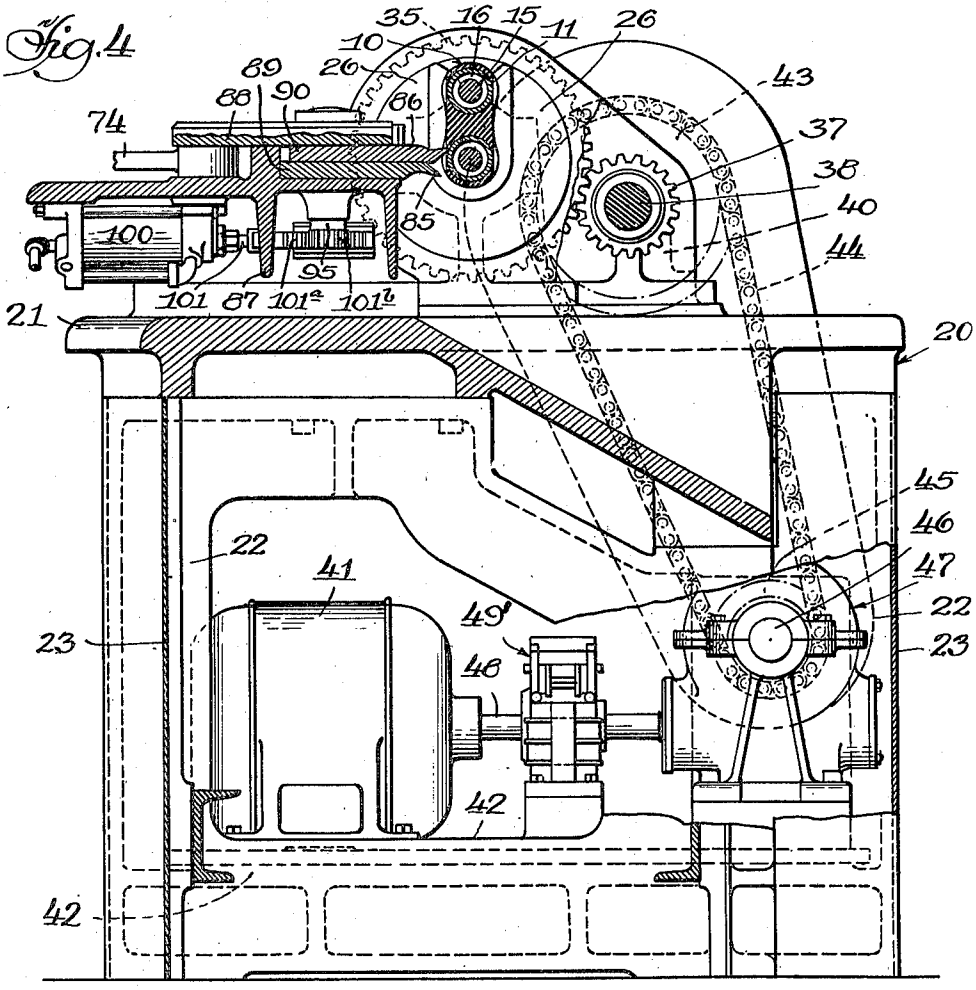
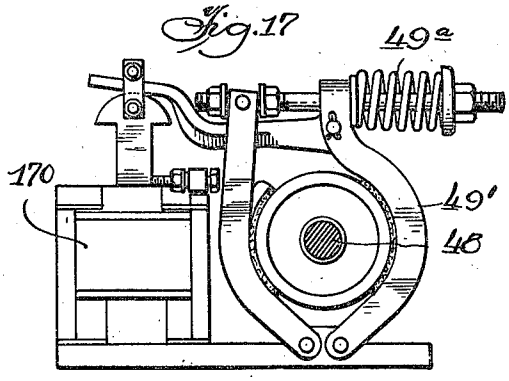
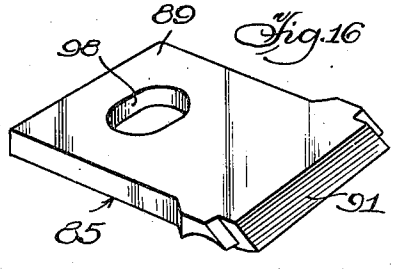



Fig. 17




Witness:
Chas. K. Hursh

Fig. 16




INVENTOR.
Ray A. Sandberg
BY
Clarence F. Poole
Atty.

Feb. 15, 1944. R. A. SANDBERG 2,341,816

RUBBER STRIPPING MACHINE

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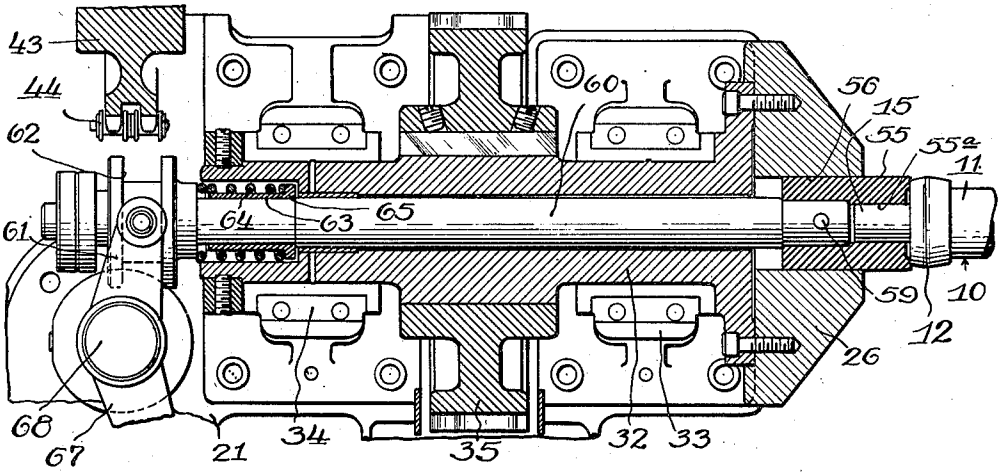



Fig. 6

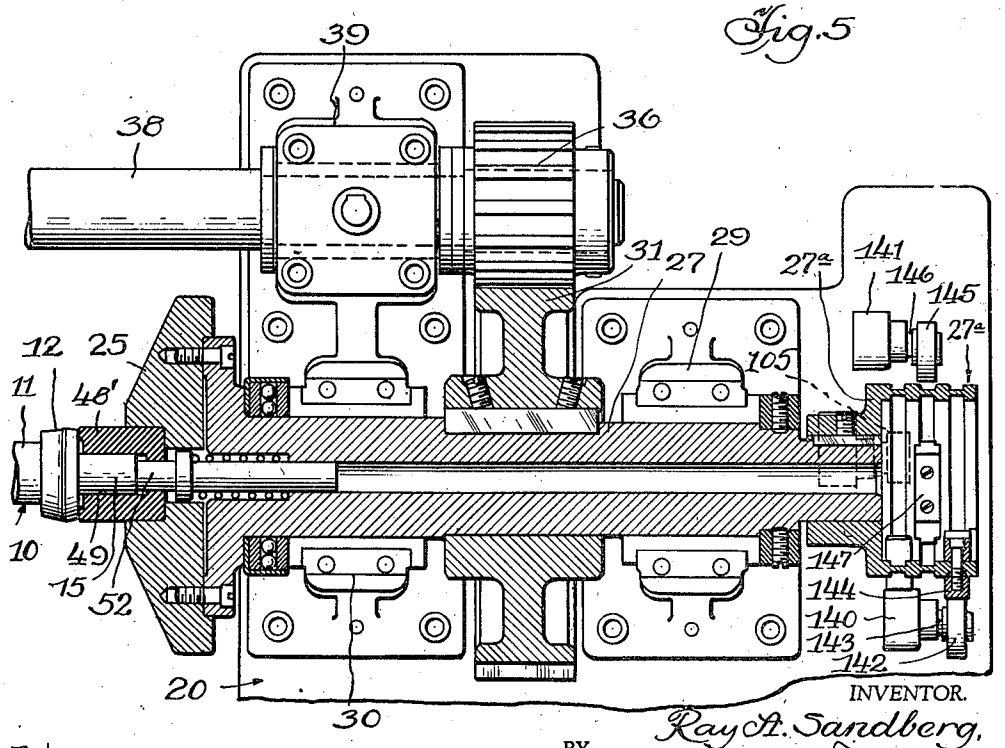



Fig. 5

INVENTOR.
Ray A. Sandberg,
BY
Clarence F. Poole
Atty.

Witness:
Chas. R. Kousch.

Feb. 15, 1944. R. A. SANDBERG 2,341,816

RUBBER STRIPPING MACHINE

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Fig. 7

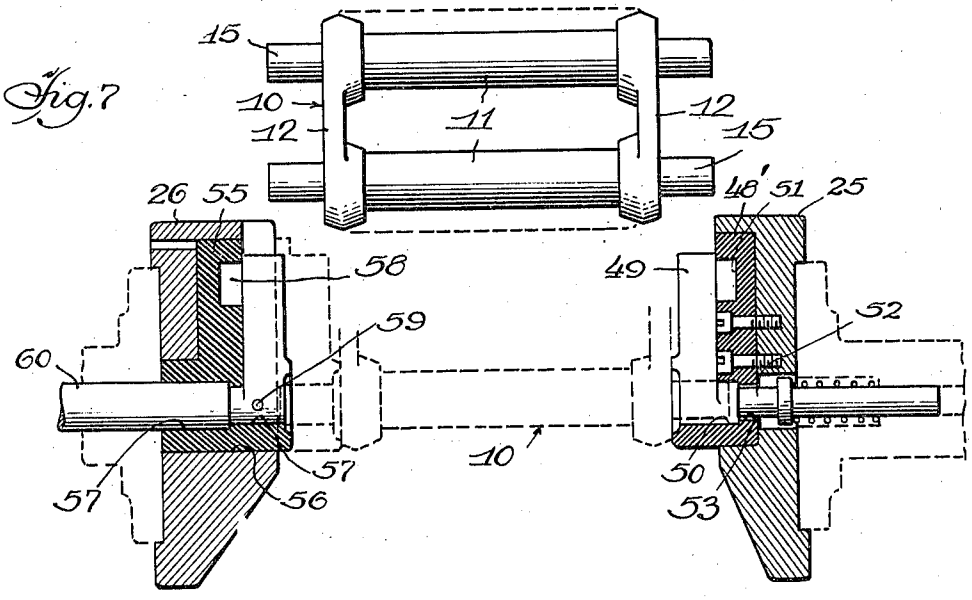



Fig. 9

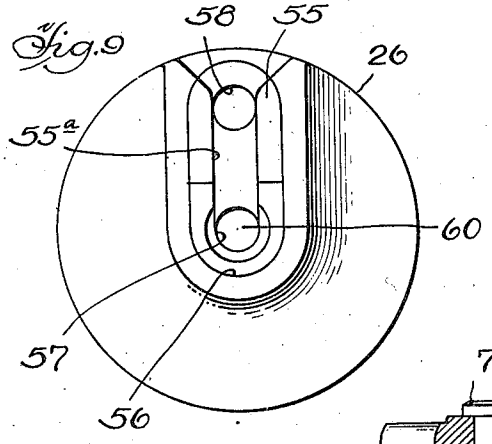



Fig. 8

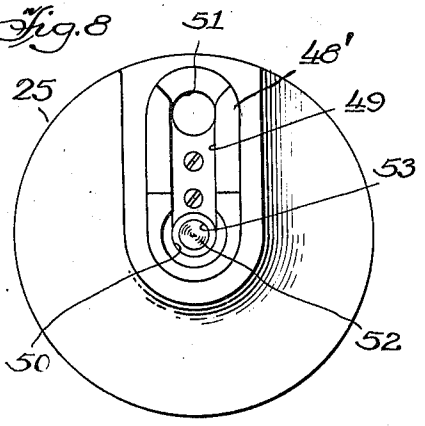
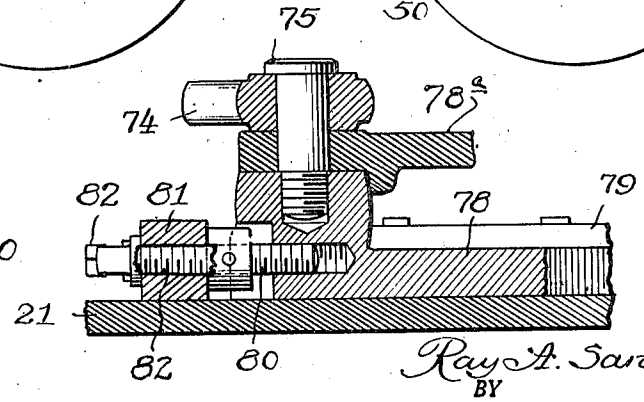



Fig. 10




INVENTOR.
Ray A. Sandberg
BY
Clarence F. Poole
Atty.

Witness:
Chas. L. Kourek.

Feb. 15, 1944. R. A. SANDBERG 2,341,816

RUBBER STRIPPING MACHINE

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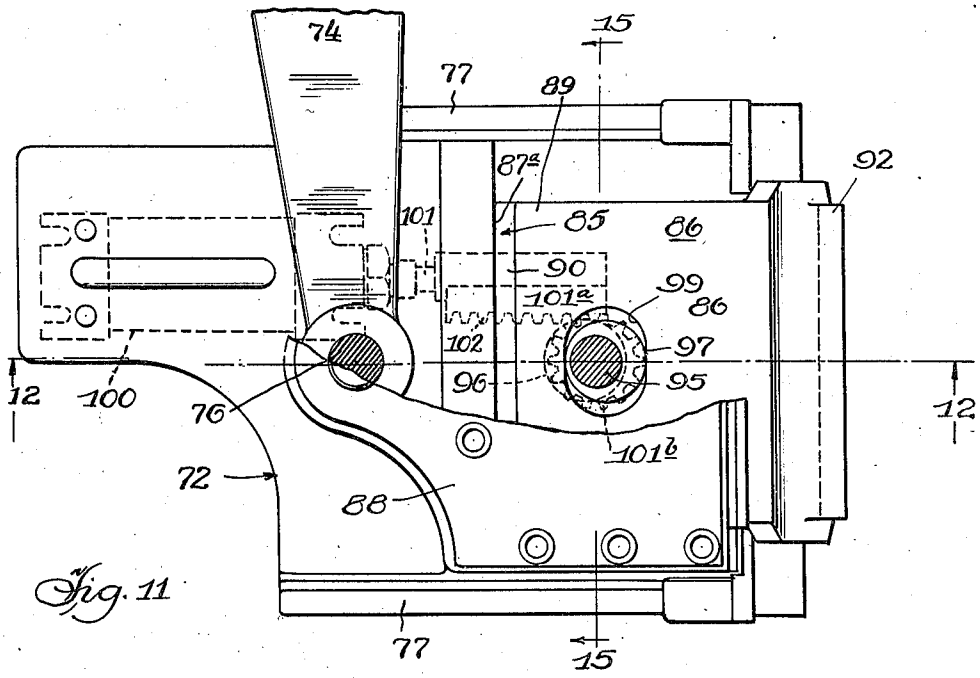



Fig. 11

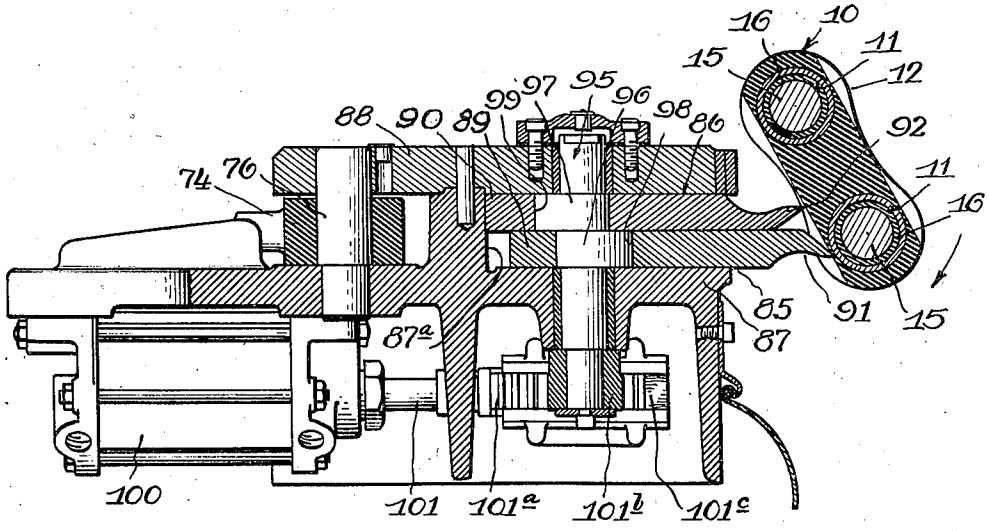



Fig. 12

INVENTOR.
Ray A. Sandberg
BY Clarence J. Poole Atty.

Witness:
Chas. L. Housh.

Feb. 15, 1944. R. A. SANDBERG 2,341,816

RUBBER STRIPPING MACHINE

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Fig. 19

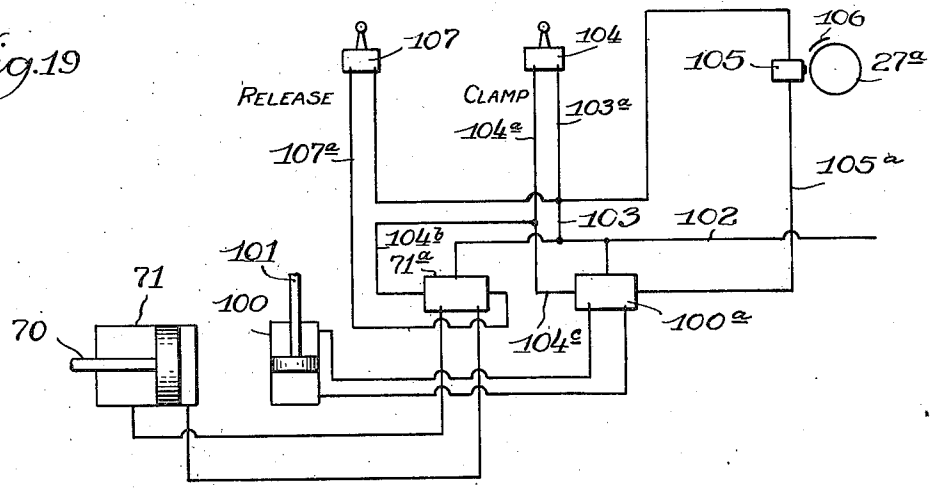
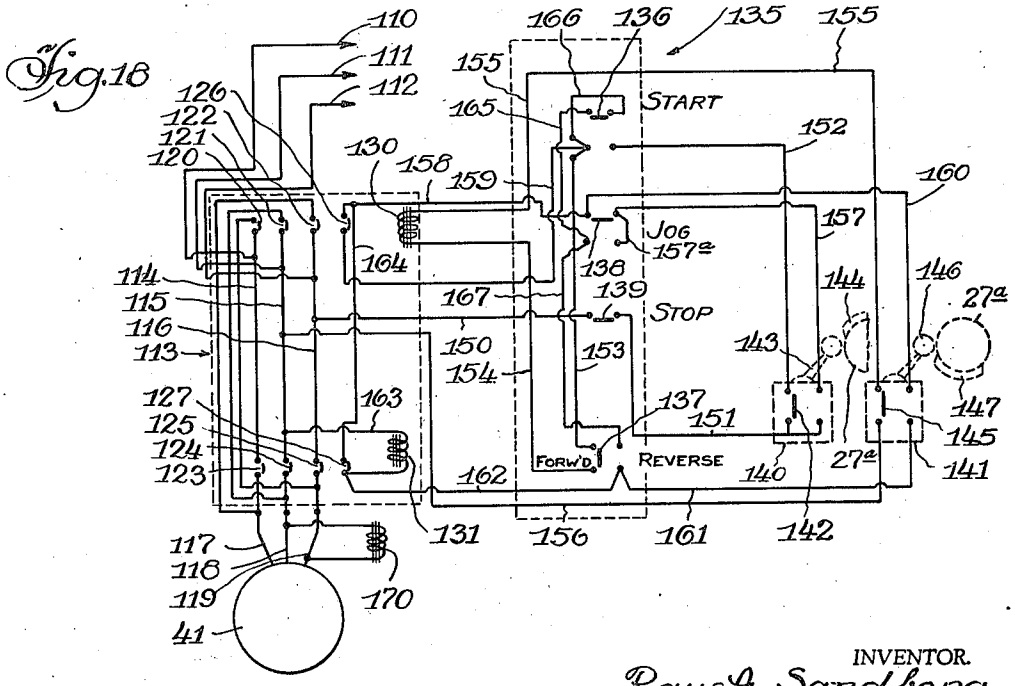



Fig. 18




Witness:
Chas. L. Kourek.

INVENTOR.
Ray A. Sandberg
BY Clarence F. Poole Atty.

Patented Feb. 15, 1944

2,341,816

# UNITED STATES PATENT OFFICE

2,341,816

## RUBBER STRIPPING MACHINE

Ray A. Sandberg, Waukegan, Ill., assignor to Burgess-Norton Manufacturing Company, Geneva, Ill., a corporation of Illinois

Application May 24, 1943, Serial No. 488,117

12 Claims. (Cl. 164—34)

This invention relates to improvements in machines or apparatus for stripping the rubber from rubber treaded links employed in endless treads for vehicles, such as armored war tanks.

Such rubber treaded links as heretofore used on rubber vehicles each consists of a rectangular metal frame made up of two tubular pivot members rigidly connected at opposite ends by metal cross members, and having a rubber tread molded in a solid block surrounding both tubular pivot members and filling the space between them. Such rubber blocks are subject to rapid wear and to deterioration, and it is frequently desirable to salvage and recondition the metal frames of the links for further use, either by applying a new rubber tread, or, as is now common practice, to replace the rubber tread with metal tread surfaces. For such reconditioning, it is necessary to strip or remove the rubber from the metal framework of the link. It has been found extremely difficult to do this either by hand or by machinery because of the peculiar shape of the link, and also the fact that the rubber is extremely tough and resistant to ordinary cutting operations and adheres to the surfaces of the metal framework so as to make its removal very difficult.

The principal object of the present invention is to provide an improved form of machine for stripping or removing the rubber from the metal framework of the link in an efficient, rapid and economical manner.

The machine of the present invention operates upon the general principle of the machine disclosed in the prior application of Clayton O. Dohrenwend, Serial No. 459,625, filed September 25, 1942, now Patent No. 2,327,027, issued August 17, 1943, but includes several features of improvement thereon, as will appear from the following description.

The invention may best be understood by reference to the accompanying drawings, in which—

Figure 1 is a perspective view of a tread link of the kind especially adapted for treatment by my improved invention;

Figure 2 is a perspective view of the tread link after it has been operated upon by the machine;

Figure 3 is a top plan view of the machine embodying the features of my present invention, showing a tread link in operating position, and the cutting means in engagement with said tread link;

Figure 4 is a vertical section of the machine taken generally on line 4—4 of Figure 3, but with parts broken away to illustrate certain details of construction;

Figure 5 is a detail section of the right hand chuck member and associated parts, taken generally on a horizontal plane including the axis of said chuck member;

Figure 6 is a detail section of the left hand chuck member and associated parts, taken generally on a horizontal plane including the axis of said chuck member;

Figure 7 is a fragmentary view, in part diagrammatic, showing the construction and operation of the chucks and their associated holding members for securing a tread link while being operated upon by the machine;

Figure 8 is a detailed face view of the right hand chuck and holding member;

Figure 9 is a detailed face view of the left hand chuck and holding member;

Figure 10 is a detail section taken on line 10—10 of Figure 3;

Figure 11 is an enlarged detail plan view of the carriage and cutting knives mounted therein, with the upper knife in extended position;

Figure 12 is a vertical section of the carriage and knives taken on line 12—12 of Figure 11, but showing the lower knife in extended position for the beginning of the scarfing operation;

Figure 13 is a detail sectional view somewhat similar to Figure 12, but showing the position of the link after the lower knife has completed its scarfing cut in one direction;

Figure 14 is a fragmentary detail section showing the cutting knives in reverse position, ready for initiating the scarfing cut in the reverse direction of rotation of the tread link;

Figure 15 is a detail vertical section through the carriage, taken on line 15—15 of Figure 11;

Figure 16 is a detail perspective view of one of the cutting knives;

Figure 17 is a detail view of the friction brake on the motor shaft;

Figure 18 is a diagram of the electric control system for the machine; and

Figure 19 is a diagram of the fluid control system for the machine.

Referring first to the details of construction of the tread links for which my improved stripping process is particularly designed, one of the tread links, indicated at 10, 10 in Figures 1 and 2, is made with a metal base frame consisting of two metal tubular pivot members 11, 11, in parallel spaced relation to each other and rigidly connected at opposite ends by metal cross members 12, 12, each having eyes 13, 13 at opposite ends

thereof, in which the metal pivot members are fixed, as by brazing or welding. Pivot pins 15 extend through each of the tubular members 11, 11, and rubber sleeves 16, 16 are usually interposed between each of said pivot pins 15 and their respective tubular members 11, so as to permit a limited torsional movement of the pivot pins in said tubular members.

As the tread link is originally made, a rubber tread is formed by molding the rubber in a solid block around and between the tubular pivot members 11, 11, said block terminating short of the outer faces of the metal cross members 12, 12. Figures 1 and 2 show the condition of the rubber block 17 after its tread surfaces have been worn away by wear to considerable extent. Although the two tread surfaces are usually reversible, they are often subject to such rapid wear that the tread link soon becomes useless and requires salvage or reconditioning for further use.

Owing to the scarcity of rubber, a preferred method of reconditioning now employed consists in replacing the rubber blocks by metal tread surfaces, as previously mentioned. But regardless of whether rubber or metal is used for the tread surfaces, it is desired to remove all of the rubber from the exterior surfaces of the metal frame of each link without harming or disturbing the rubber bushings 16, 16 within the tubular members 11, 11, and surrounding the pivot pins 15, 15, as previously described. The machine of the present invention is particularly designed for this purpose and details thereof will now be described.

The improved machine of the present invention includes a main frame indicated at 20, having a horizontal bed plate 21, and a plurality of upright legs or supports 22, 22, having upright side plates 23, 23, suitably arranged therebetween to form a casing for the mechanism below the bed plate.

Two laterally spaced, opposed chuck members 25, 26, are disposed on a common axis extending longitudinally of the bed plate to provide means for securing a tread link therebetween when being operated upon by the machine.

The right hand chuck 25 is fixed on a spindle 27 (see Figure 5), which has bearing in spaced upstanding bearing blocks 29 and 30. Said spindle has a gear 31 keyed thereon. The left hand chuck 26 is fixed on the inner end of a spindle 32, which has bearing in spaced bearing blocks 33 and 34 (see Figure 6), and has a gear 35 fixed thereon.

The two gears 31 and 35 are of the same pitch diameter and are driven by similar pinions 36 and 37, respectively, mounted on a common drive shaft 38. Said drive shaft extends longitudinally along the rear of the bed plate and is journaled in bearing blocks 39 and 40. With this gearing arrangement the two chucks are driven in unison on a common horizontal axis.

The drive shaft 38 is driven by an electric motor 41 supported on a shelf 42 forming part of the main frame beneath the bed plate. As shown herein, the drive shaft 38 has a chain sprocket 43 fixed on the outer end thereof engaged by a chain 44, which is also trained over a chain sprocket 45 on a shaft 46. The latter shaft is driven from a worm gear reducer of the usual construction, indicated generally at 47. Said gear reducer is driven from the motor 41 by a shaft 43, which also has a friction clutch 49' associated therewith. The electric motor is of the usual reversible type, so as to drive the chuck members 25 and 26 in opposite directions, as will hereinafter more fully appear.

The chuck members 25 and 26 have means for receiving and automatically chucking the tread links while they are being operated upon by the machine, as shown in detail in Figures 7, 8 and 9. Fixed on the face of the right hand chuck member 25 is a holding member 48', which has a U-shaped slot 49 of such size as to receive the projecting ends of the pivot pins 15, 15, at one end of a tread link in sliding engagement therein. In the base of the slot 49 two recessed bores 50 and 51 are provided, the first of which is disposed concentrically of the chuck member to receive the end of one of said pivot pins, and the other of which is in off-centered radial relation with said chuck. A spring-pressed plunger 52 projects through an aperture 53 in the base of the recessed centered bore 50 in the holding member 48', and is adapted to engage the adjacent outer end of the centered pivot pin 15 of the tread link when the latter is mounted in the chuck, so as to serve as a knockout for the tread link when it is released from the chuck, as will presently be described.

The opposite left chuck member 26 has a somewhat similarly designed holding member 55 mounted therein, excepting that in this case the said holding member is slidably mounted in a recess 56 formed in the face of said chuck member, so as to have limited movement axially of the chuck member, as indicated in Figure 7. Two bores 57 and 58 are formed in the face of the holding member 55, corresponding to the pin receiving bores 50 and 51 in the right hand holding member 48'.

The slideable holding member 55 is fixed, as by a pin 59, to the outer end of a rod 60, which extends axially through the driving spindle 32 of the chuck member 26 and is arranged to be shifted longitudinally by means of a yoke 61 which engages a grooved collar 62 mounted at the outer end of said rod.

The collar 62 is preferably connected to the rod 60 through a yieldable lost-motion device herein consisting of a sleeve 63 fixed on said rod and a coil-spring 64 surrounding said sleeve, having the inner end thereof suitably attached to the flanged inner end 65 of the sleeve 63, and its outer end suitably attached to the collar 62. The spring 64 is relatively stiff, so that normally the rod 60 will shift with the collar for moving the holding member 55 into and out of chucking relation with the adjacent cross member 12 of the tread link and exert a holding pressure on the tread link when the latter is in fully chucked position between the holding members 55 and 48'. This holding arrangement affords compensation for slight variations in the overall length of the cross members 12, 12, the outer faces of which sometimes become worn from field service. It also protects the machine against injury if the opposite ends of the tread link may be improperly seated between the opposed holding members 55 and 49'.

The yoke 61, which shifts the holding member 55, through rod 60, as just described, is integral with a lever 67 pivoted on an upright pin 68 suitably fixed on the bed plate 21. Said lever has its forward end connected by pivot pin 69 to the end of a piston rod 70 associated with a fluid cylinder 71 mounted above bed plate 21, longitudinally of the machine. Power connections for actuating and controlling the operation of the

fluid cylinder 71 will hereinafter be more fully described.

The fluid cylinder 71 also actuates a carriage indicated generally at 72, which is slidably mounted on the front end of the bed plate, for moving the cutting means into and out of operative position relative to the work. The pin 69 on the end of piston rod 70 is connected by a link 73 to the outer end of a rocking lever 74, which extends generally along the front of the bed plate, and is pivoted intermediate its ends on an upright pin 75. Said rocking lever is connected at its inner end to a pin 76 on the carriage 72. Said carriage is guided for its horizontal slidable movement between suitable guides 77, 77, fixed on the bed plate 21 (see Figure 15).

In the preferred form shown herein, the upright pivot pin 75 on which the rocking lever 74 is pivoted, is mounted on a slidable base member 78 which is secured between guides 79, 79, for movement forwardly or rearwardly of the bed plate, to compensate for necessary variations in positioning of the cutting means on the carriage. Adjustment of the base member 78 is accomplished by a threaded rod 80 extending through an annular block 81 fixed to the front end of the bed plate, and having its outer end in position to be engaged for rotation by a suitable tool. The adjusting rod 80 may be supplemented by a pair of bolts 82, 82, which may also extend through the anchor block on opposite sides of the adjusting rod 80, and are adapted to engage the outer face of the base 78 to resist forward displacement of the latter. The base member 78 also has a rearward extension 78*a* secured thereto, on which the inner end of the fluid cylinder 71 is pivotally mounted, as by upright pin 71*b* (see Figure 3), to permit swivelling movement of said cylinder.

The cutting means for scarfing or removing the rubber from the tread links includes a pair of knives 85, 86, which are arranged one above the other in longitudinal slidable relation between recessed side walls of a base portion 87 of the carriage, and below a cover plate 88 of the latter. Said knives consist of rear base portions 89 and 90 respectively, which are generally rectangular in shape, and forward ends, which are formed with cutting blades 91 and 92 respectively. The said cutter blades are arranged at mutually reversed angles to each other, shown in the various figures. The arrangement is such that the lower knife 85 may project forwardly when the tread link is being rotated in a clockwise direction, while the upper knife is projected forwardly into cutting position when the tread link is being rotated in a counterclockwise direction.

The means for shifting the cutting knives alternately into their respective cutting positions comprises an upright shaft 95, having a pair of eccentrics 96 and 97 intermediate its ends, which respectively engage in transverse slots 98 and 99 formed adjacent the rear ends of the knives 85, 86. The upper end of the shaft 95 has bearing in the cover plate 88 of the carriage, and its lower end has bearing in the base portion 87 of said ram, as shown in Figure 12. The shaft 95 is rotated by power means carried on and movable with the ram.

In the form shown, the power actuating means for shaft 95 comprises a fluid cylinder 100 mounted horizontally beneath a projecting front portion of the carriage base, and having a piston rod 101 projecting rearwardly, carrying a rack member 101*a* thereon for engaging a pinion 101*b* fixed on the lower end of the shaft 95. The rack member 101*a* has its rear face supported in a guide 101*c* carried by the base portion 87 of the ram, as shown in Figure 15. The means for actuating and controlling the operation of the fluid cylinder 100 will hereinafter more fully appear.

The two eccentrics 96 and 97 on shaft 95 are offset from each other at an angle of 180 degrees. Thus, by rotation of the shaft 95, the two eccentrics 96 and 97 will operate to shift the knives 85 and 86 forwardly and rearwardly in alternate relation with each other. In other words, when the lower knife 85 is projected forwardly, the upper knife 86 will be withdrawn rearwardly, and vice versa.

In the preferred arrangement, shown in detail in Figures 11, 12 and 13, it will be observed that when one of the knives, as, for instance, the lower knife 85, is in its forwardly projected position, the other or upper knife 86 will be withdrawn so that its rear face engages the upright wall 87*a* of the recess within which the two knives are mounted. In this manner, the reaction upon the projected knife 85 is carried directly through the lower eccentric 96, the adjacent upper eccentric 97, and the upper knife 86 to the rear wall 87*a*. Since the latter wall is integral with the base member 87 of the carriage the eccentric shaft 95 will thus be relieved of much of the thrusting pressure which it would otherwise be called upon to withstand. Similarly, when the lower knife 85 is withdrawn and the upper knife projected forwardly, the rear face of the lower knife will engage the upright wall 87*a* so as to exert a thrusting force on the upper knife from said upright wall through the two eccentrics 97 and 96.

With the carriage mechanism just described, it will be understood that the knife blades carried thereby may be withdrawn bodily from the vicinity of the work by means of the fluid cylinder 71 and its position 70, which actuates the rocking lever 74, so as to give easy access to the chuck members 25 and 26 for insertion or removal of the tread links. Simultaneously with the rearward withdrawal of the carriage with its knives, the fluid piston cylinder 70 also withdraws the left hand holding member 55 of the chuck through the lever 67, yoke 61, collar 62 and rod 60, as previously described, so as to position the left hand holding member 55 either for receiving a tread link prior to the scarfing operation, or for the release of a tread link after the scarfing operation has been completed.

The fluid control mechanism for the fluid cylinders 71 and 100 is shown diagrammatically in Figure 19. 71*a* and 100*a* indicate two master control valves of a well-known commercial type, which are designed to supply air pressure in the usual manner to opposite ends of the cylinders 71 and 100 respectively. These master control valves are designed for operation either by bleeding or supplying air at one end or the other. Varying the air pressure at one end of the master valve piston causes the valve to be set so as to supply pressure to one end of the power cylinder with which it is associated and relieve the pressure from the other end of said cylinder, while varying the air pressure at the opposite end of the master valve piston reverses the operation of the power cylinder, in the usual manner.

In the arrangement shown in the diagram, the two master control valves 71*a* and 100*a* are supplied with fluid pressure from a main line 102. The master control valve 71*a* for cylinder 71, which controls the movement of the knife carriage 72 and the operation of the chuck holding

or clamping member 26, as previously described, is controlled for operation in one direction by a manually operated bleeder valve 104, which is conveniently mounted on the bed plate 21. This bleeder valve 104 shown is of the pressure operated type, receiving pressure from the main line 102 through line 103 and branch line 103a. A line 104a from said bleeder valve leads through branch line 104b to the left end of master control valve 71a so as to set the latter valve for moving the piston 70 toward the left for clamping the work, and simultaneously advancing the carriage 72 toward the work, when the bleeder valve 104 is normally operated.

The bleeder valve 104 is also connected to the left side of the master control valve 100a by lines 104a, 104c, so as to set the latter valve for moving piston 101 in cylinder 100, thereby projecting the lower knife 85 forwardly into scarfing position, while retracting the upper knife 86, when the bleeder valve 104 is operated.

A second bleeder valve 105 is connected through line 105a to the right side of master control valve 100a. This bleeder valve is automatically actuated by a cam member 106 mounted on a cam drum 27a, which is fixed on the right end of the chuck spindle 27, as shown in Figure 5, so as to rotate in timed relation with the chuck members 25 and 26. Said cam is designed to operate the bleeder valve 105 when the work reaches a predetermined position, at which its scarfing operation in the clockwise direction has been completed, and rotation of the work is automatically reversed by an electric control mechanism to be hereinafter more fully described. Operation of the bleeder valve 105 sets the master control valve 100a so as to reverse the position of the piston 101 in cylinder 100, thereby causing the lower knife 85 to be retracted and the upper knife 86 to be automatically advanced into position for making the scarfing cut in a counterclockwise direction.

A third bleeder valve 107 located on the bed plate 21 adjacent valve 104 has a line 107a connected to the right side of the master control valve 71a. Operation of valve 107 causes the last-named master control valve to be set in position to withdraw the piston 70 in cylinder 71 toward the right, thus releasing the work from the chuck members, and simultaneously withdrawing the carriage 72 from the work.

The control mechanism for starting, reversing or stopping the electric motor 41 so as to rotate the work in its proper cycle for scarfing is shown in the electric diagram, Figure 18. The motor is of the three-phase reversible type, operated from main supply lines 110, 111 and 112. A remote control reversing switch unit of the magnetic type is indicated generally at 113, including three main line conductors 114, 115 and 116, adapted to be connected reversely with the motor leads 117, 118 and 119 by two sets of reversing contacts 120, 121 and 122, and 123, 124 and 125, respectively.

The contacts 120, 121 and 122 which connect the motor for forward rotation (to rotate the work in a clockwise direction, as seen in Figures 12 and 13) are arranged to be closed by a magnetic coil 130. Said coil also closes an auxiliary contact 126 in the control circuit. The contacts 123, 124 and 125 which connect the motor for rotation in the reverse direction, are arranged to be closed by a magnetic coil 131. The latter coil also closes an auxiliary contact 127 in the control circuit.

A manual control switch panel is indicated generally at 135, and is provided with a plurality of push-button control contacts 136, 137, 138 and 139. Two cam-controlled snap lock limit switches, indicated at 140 and 141, are also provided. Switch 140 has a contact member 142, thrown by an arm 143 under control of a cam member 144 on a cam drum 27a fixed on the outer end of the chuck spindle 27, as seen in Figure 5. Switch 141 has a contact member 145, thrown by an arm 146 under control of a cam member 147 on the cam drum 27a.

The magnetic reversing switch 113, the push button control switches 136, 137, 138 and 139, and the snap lock limit switches 140 and 141 are all of well known constructions, so need not be shown in greater detail, excepting to point out the various circuit connections which provide control of the operation of the motor during its normal operating cycle, as well as manual control means for modifying its normal operating cycle, when desired.

In the initial or starting position of the work as shown in Figure 12, the several manual control contacts on the control panel 135 are normally maintained by spring pressure in the positions shown in the diagram, Figure 18. The forward and reverse coils 130 and 131 will be deenergized, and the main line contacts associated therewith will be open.

The motor is started in its forward direction to rotate the chucks in a clockwise direction, by depressing momentarily the push-button contact 136 on panel 135. Said button may, for convenience, be referred to as the starting button. This establishes a control circuit from the main line conductors through the forward coil 130, as follows: from main conductor 116 through line 150, button contact 139, line 151, limit switch contact 142, line 152, button contact 136, line 153, contact 137, line 154, forward coil 130, line 155, limit switch contact 145, and line 156 to main line conductor 115.

Energizing of the forward coil 130 will close the main line contacts 120, 121 and 122, to start the motor in its forward direction. As soon as the motor starts, cam 144 of limit switch 140 releases the arm 143 so that switch contact 142 is shifted to the right. Since auxiliary contact 126 is now closed by forward coil 130, a second or "holding" current is established through said forward coil 130, as follows: from contact 142 of limit switch 140, through line 157, button 138, line 158, contact 126, lines 159 and 153, contact 137, line 154, forward coil 130, line 155, limit switch contact 145, and line 156, to main line conductor 115. It will be observed that as soon as this second or "holding" circuit is established, the starting button 136 may be released and returned to its initial position.

The motor will then continue its rotation (unless interrupted by operation of certain manual control buttons, as will hereinafter be described) until cam 147 of the limit switch 141 trips arm 146 and throws contact 145 to the right. This movement causes automatic reversal of the motor in the following manner:

The "holding" circuit, through contact 145, is broken, causing the main line contacts 120, 121 and 122 to open. A new circuit is now established through the reverse coil 131 as follows: from lines 150 and 151, through contact 142, line 157, button contact 138, line 160, contact 145, lines 161 and 162, reverse coil 131, and line 163, to main line conductor 115. The reverse coil then closes

the main line contacts 123, 124 and 125 to rotate the motor in its reverse direction, and also closes the auxiliary contact 127. This latter contact then establishes a "holding" circuit from lines 150 and 151, through contact 142, line 157, button 138, lines 158 and 164, contact 127, reversal coil 131, and line 163. Shortly after the motor is reversed, and the "holding" circuit established, the contact 145 of limit switch 141 is returned to its initial position because of disengagement with its cam 147. The motor then continues rotation in reverse direction until it is automatically stopped at its initial starting position, wherein the cam 144 of limit switch 140 engages arm 143 and throws contact 142 to the left, thereby breaking the "holding" circuit. The motor then stops in its initial starting position, ready to be started in another cycle, by depressing the starting button, as before described.

To insure against overrunning of the motor in either direction, the friction brake 49' on the motor shaft is normally set by a spring 49a, but the tension of said spring is overcome by a coil 170, connected across the main motor leads 118 and 119, whenever the motor circuit is closed in forward or reverse. However, the brake is immediately set by the spring 49a as soon as the motor circuit is broken.

The manual control buttons 137, 138 and 139 are provided to afford greater facility and safety in the operation of the machine, as follows:

The button 138, which, for convenience, may be termed the "jog" button, affords a control for stopping and restarting the motor at will during its normal cycle of operation. As the name indicates, the button 138 can be used to "jog" the motor at any time after it has been initially started by the starting button 136, and contact 142 has been thrown to the right. For instance, by depressing the "jog" button 138 partially, the "holding" circuits which may have been established through said button, in a forward direction, as previously described, will be broken so as to stop the motor temporarily. When said "jog" button is further depressed so as to connect lines 157a and 165, it will be seen that a circuit will be established through line 165, contact 136, lines 166 and 153, contact 137 and the forward coil 130, under direct manual control of the "jog" button, and forward rotation will continue until the reversing limit switch contact 145 is automatically shifted to the right by cam 147.

It will further be observed that it is possible to stop and reverse the chuck members at will while they are normally rotating in either direction. Such reversal is sometimes found desirable where a link may be jammed in such position through accident that further rotation in the same direction would cause damage to the machine. When the motor is rotating in its normal forward direction, reversal may be effected by depressing the "jog" button 138 partially, and shifting the control button 137 into its "reversed" position toward the right. Further depression of the "jog" button will then complete a circuit through the reverse coil 131 by way of lines 167 and 162, instead of through the forward coil 130.

When the motor is being rotated in reverse direction during normal operation, it may be "backed up" or run in a forward direction. This is accomplished by depressing the "jog" button temporarily. This will break the holding circuit through the reverse coil 131 and contact 127, to stop the motor. Further depression of the "jog" button will then establish a new circuit through the forward coil 130 by way of lines 165, 166 and 153, to cause the motor to rotate forwardly. It will be understood, however, that for normal operation the button 137 should be maintained in its "forward" position toward the left.

The "jog" button 137 may also be used to start the motor in case the other controls fail temporarily to work properly.

The "stop" button 139 is intended primarily for use as a stop in case of emergency. It operates immediately to break all control circuits to either forward or reverse coils and stop the motor, regardless of the positions of the other control devices.

The operation of the machine may now be described as follows:

The starting position of the chuck members 25 and 26 is such as to hold the tread link 11 substantially in the position shown in Figure 12. In this position, the U-shaped holding members 48' and 55 carried by the chuck members have the open ends of their slots 49 and 55a, respectively, extending upwardly and inclined slightly toward the front of the machine in position to receive the projecting pivot pins 15, 15 of the tread link in sliding engagement therein.

In this starting position, the fluid control system will be set by the clamp release valve 107, so that the piston 70 associated with the fluid cylinder 71 has withdrawn the holding member 55 of the chuck 26 towards the left, and the carriage 72 is withdrawn to its forwardmost position. When the tread link is dropped into position between the holding members 55 and 48', the clamping lever 104 is actuated so as to extend the piston 70 in cylinder 71, thereby chucking the work securely between the holding members with the opposite projecting ends of the lowermost pivot pins 15, 15, and the lower cylindrical member 11, held in centered relation with the chuck members. Simultaneously, operation of the piston 70 causes the carriage 72 with its knives to be moved rearwardly of the machine toward the centered frame member 11 of the work.

Operation of the clamping lever also causes the lower cutting knife 85 to be projected forwardly into cutting position, as shown in Figure 12, so that the blade 91 of said lower knife is disposed at a cutting angle toward the adjacent end of the tread link, and will be forced into engagement with the tread surface of the latter along the line opposite the lower or centered tubular member 11, where the rubber covering is thinnest.

The electric motor 41 is then started by depressing the starting button 136 momentarily, as previously described in connection with the description of the electric system illustrated in Figure 19. The motor then rotates the tread link in a clockwise direction, as indicated in Figure 13. Pressure applied from fluid cylinder 71 causes the lower knife blade 91 to cut immediately through the relatively thin rubber covering into direct scraping or scarfing contact with the surface of the centered tubular member 11 of the work.

As soon as the motor is started, the cam 144 releases arm 143 of the limit switch 140 so as to shift the contact 142 toward the right (see Figure 18). This establishes a holding circuit for the forward coil 130 so that rotation of the work in a clockwise direction is continued until the work reaches a position substantially as shown in full lines in Figure 13. At this point rotation is stopped by actuation of the limit switch 141 by cam 147, which breaks the holding circuit through the forward coil 130, and automatically reverses

the rotation of the work through the circuit connections previously described.

It will be observed that when the work reaches its reversing position shown in Figure 13, the lower knife 85 will have produced a scarfing cut circumferentially around the outer end of the tubular member and will be projected inwardly between the two tubular members 11, 11, to a line adjacent the median plane including the axes of said tubular members. Although in some instances the scarfing may be extended to said median plane, yet it is usually preferable to leave a relatively small area adjacent the median plane uncut and depend upon a subsequent punching operation for final removal of the rubber or block, as will hereinafter be described.

Substantially simultaneously with the automatic reversal of the motor through the electric control system as previously described, the cam member 106 associated with the fluid control system actuates the bleeder valve 105 so as to retract the lower knife 85 and advance the upper knife 86 into cutting position, as indicated in Figure 14. Thereupon, further rotation of the work in a reverse or counterclockwise direction causes the blade 92 of the upper knife 86 to contact the adjacent surface of the tubular member 11 in the area which has previously been scarfed by the lower blade 91, but at a reverse angle thereto, as shown in Figure 14. The lower blade 91 thereafter completes the scarfing cut circumferentially around the previously uncut tubular member until the tread link reaches its starting position, substantially as shown in dotted lines in Figure 13.

It will be observed in Figure 14, that the arcuate portion of rubber already severed from the tubular member 11 will be held away from the latter by the lower blade 91 during the return rotation of the work, so that said severed portion of rubber cannot interfere with the scarfing by the upper blade 92.

When the work reaches the starting position after reversal in a counterclockwise direction, the limit switch 140 is actuated so as to stop the work automatically. As in the case of the lower blade 91, the arrangement is such that the upper blade 92 may cut almost to the median plane including the axes of the two tubular members 11, 11, so as to form substantially a complete cut around the first tubular member, excepting as to a small area of unscarfed rubber which may be left along the inner side of said member to be severed by a subsequent operation.

When the work has reached its starting position, and its normal cycle of operation is completed, the work may then be released by operation of the release valve 107 of the fluid control system, which causes the work to be unclamped in the chuck members and the ram 72 with its knives to be withdrawn rearwardly from the work.

When the holding member 55 of the chuck 26 is withdrawn to the left to release its clamping pressure on the end of the tread link, the knockout pin 52 moves the opposite end of the tread link to the left, to release the proximate ends of pivot pins 15, 15 from recesses 50 and 51 in the holding member 48'. The tread link can then be readily lifted from between the holding members 48' and 55.

The scarfing operation thus described may then be repeated on the second tubular member 11 of the same link, in the same manner. It is usually preferable, however, that said link be reversed end to end when it is removed and replaced between the chuck mmbers, so that when the second tubular member is centered between the chuck member, the lower blade 85 will make its initial cut on the same side or tread surface of the link as it did with the first tubular member. As a result, the final parting lines or cuts opening to both tubular members 11, 11 will be located along the same tread surface of the link, as clearly shown in Figure 2, so as to facilitate the final removal of the severed rubber block. This may now be readily accomplished in any suitable manner. A preferred method consists in engaging the area between the two lines of cut by a suitable punch, whereby the rubber block can be removed from between and around the tubular members. This punching operation will effectively sever any unscarfed portions which may remain in the limited areas between the two tubular members, as previously described.

It will be understood from the above description that the normal cycle of operation of the machine consists in starting the motor by manual operation of the starting button 136, so that the work rotates forwardly through an angle of approximately 240 degrees in a clockwise direction, stops, reverses automatically, and rotates in a counterclockwise direction to its starting position, where it is stopped automatically. It will be understood, however, that this normal cycle may be modified when desired or necessary by manual operation of the "jog" button 138, the forward and reverse button 137, or the emergency stop button 139 on panel 135, as previously described in connection with the description of the electric control system shown in the diagram, Figure 18.

It will be observed that the lever 67 and link 73 cooperate with the piston rod 70 of the fluid cylinder 71 so as to form in effect a toggle arrangement for causing the simultaneous advance and withdrawal of the carriage 72 with its knives and the advance or withdrawal of the holding member 55 of the chuck 26, as previously described.

Although I have shown and described a preferred embodiment of my invention, it is to be understood that I do not wish to be limited to the exact embodiment of the device shown, which is merely by way of illustration and not limitation, as various other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention and scope of the claims.

I claim:

1. In a scarfing machine for stripping a rubber block from a rectangular metal frame of a tread link or the like having two spaced parallel cylindrical members between and around which said rubber block is molded, said machine including reversibly driven chuck means, holding means on said chuck means for securing said frame with one of the cylindrical members thereof centered in said chuck means, knife supporting means movable radially of said chuck means, and power means operative to move said holding means and said knife supporting means simultaneously into and out of operating engagement with said centered cylindrical member.

2. In a scarfing machine for stripping a rubber block from a rectangular metal frame of a tread link or the like having two spaced parallel cylindrical members between and around which said rubber block is molded, said machine including two reversibly driven, opposed chuck members,

holding members mounted oppositely to each other on each of said chuck members, each having slots extending radially of the latter and open at their outer ends to receive the opposite ends of said frame in sliding engagement therein, one of said holding members being axially movable in its chuck member to clutch the opposite ends of said frame within the slots of said holding members.

3. In a scarfing machine for stripping a rubber block from a rectangular metal frame of a tread link or the like having two spaced parallel cylindrical members between and around which said rubber block is molded, said machine including two reversibly driven, opposed chuck members, holding members mounted on each of said chuck members, each having slots extending radially of the latter and open at their outer ends to receive the opposite ends of said frame in sliding engagement therein, one of said holding members being axially movable in its chuck member, and the other of said holding members being recessed to receive an end portion of said frame in laterally fitting engagement therein with one of the cylindrical members of said frame in centered relation to said chuck members when the opposite holding member is in advanced position.

4. In a scarfing machine for stripping a rubber block from a rectangular metal frame of a tread link or the like having two spaced parallel cylindrical members between and around which said rubber block is molded, said machine including two reversibly driven, opposed chuck members, holding members mounted on each of said chuck members, each having slots extending radially of the latter and open at their outer ends to receive the opposite ends of said frame in sliding engagement therein, one of said holding members being axially movable in its chuck member, and the other of said holding members being recessed to receive an end portion of said frame in laterally fitting engagement therein with one of the cylindrical members of said frame in centered relation to said chuck members when the opposite holding member is in advanced position, and spring-pressed knockout means in said recessed holding member for releasing the frame from the latter when the opposite holding member is in retracted position.

5. In a scarfing machine for stripping rubber from a rectangular metal frame of a tread link or the like having two spaced parallel cylindrical members between and around which said rubber block is molded, said machine including two opposed chuck members for holding a tread link with one of its cylindrical frame members in centered position therebetween, means for rotating said chuck members reversibly in unison, a carriage guided for movement by power radially of said holding member, a pair of knife blades slidably mounted on said carriage and having their cutting edges arranged at reverse cutting angles relative to each other, and power means on said carriage for alternatively projecting said knife blades into scarfing position in each direction of rotation of said chuck members.

6. In a scarfing machine for stripping rubber from a rectangular metal frame of a tread link or the like having two spaced parallel cylindrical members between and around which said rubber block is molded, said machine including two opposed chuck members for holding a tread link with one of its cylindrical frame members in centered position therebetween, means for rotating said chuck members reversibly in unison, a carriage guided for movement by power radially of said holding member, a pair of knife blades slidably mounted on said carriage in mutual supporting engagement with each other and having their cutting edges arranged at reverse cutting angles relative to each other, and power means on said carriage for alternatively projecting said knife blades into scarfing position in each direction of rotation of said chuck members.

7. In a scarfing machine, a frame, a reversibly driven chuck on said frame, a carriage guided for movement on said frame radially of said chuck, a pair of knife blades slidably mounted one above the other on said carriage in mutually supporting engagement with each other, but having their cutting edges arranged at reverse cutting angles relative to each other, cam means on said carriage alternatively extending or retracting said knife blades relative to said carriage, and power means for actuating said cam means.

8. In a scarfing machine, a frame, a reversibly driven chuck on said frame, a carriage guided for movement on said frame radially of said chuck, a pair of knife blades slidably mounted one above the other on said carriage in mutually supporting engagement with each other, but having their cutting edges arranged at reverse cutting angles relative to each other, cam means on said carriage alternatively extending or retracting said knife blades relative to said carriage, and power means operable at predetermined positions of said reversibly driven chuck member for actuating said cam means.

9. A scarfing machine of the character described including two opposed chuck members for holding the work in centered position therebetween, a motor for rotating said chuck members reversibly in unison, a carriage guided for movement by power radially of said chuck members, knife means carried by said carriage adjustable at reverse scarfing angles relative to the work in each direction of rotation of the latter, power means on said carriage for effecting adjustment of said knife means, automatic control means for reversing the direction of rotation of said motor at a predetermined point, and control means for said last-named knife adjusting means adapted to reverse the scarfing angle of said knife means automatically upon reversal of the direction of rotation of said motor.

10. A scarfing machine of the character described including two opposed chuck members, holding means on said chuck members for securing the work in centered position therebetween, a motor for rotating said chuck members reversibly in unison, a carriage guided for movement by power radially of said chuck members, knife means carried by said carriage adjustable at reverse scarfing angles relative to the work in each direction of rotation of the latter, power means on said carriage for effecting adjustment of said knifing means, power means operative to move said holding means and said carriage simultaneously into and out of operative engagement with said centered cylindrical member, and manually controlled means for said power means also operatively connected with said power adjusting knife means on said carriage so as to effect adjustment of said knife means automatically into predetermined scarfing angle relative to the work simultaneously with the actuation of said holding means and the movement of said carriage toward the work.

11. In a machine of the class described, a chuck, a drive motor for said chuck, reverse switch mechanism for said motor including a forward and reverse coil, a control circuit for selectively energizing said coils including two cam-operated limit switches operable in timed relation with said chuck, one of said switches being adapted to complete a circuit through said forward coil and the other limit switch between predetermined points of rotation of said chuck for rotating the chuck forwardly, and the other switch being adapted to break said forward holding circuit at another predetermined point and to complete the second holding circuit through said reverse coil and the first-named limit switch for rotating said chuck reversely until said second limit switch is actuated to break said reverse holding circuit and stop the motor, a manually-controlled switch member for starting said motor in its forward direction, a second manually-controlled switch member normally closing both of the holding circuits established by said limit switches, circuit connections from said second manually-controlled switch member and selectively operable by the latter including a third manually-controlled switch member selectively operable to establish a circuit at will through the forward or reverse coils, whereby said second manually-controlled switch member may be operated to break the normal holding circuits at will to stop the motor and establish a circuit through either the forward or reverse coil.

12. In a machine of the character described including a frame, reversely driven chuck means supported on said frame, axially movable holding means on said chuck means for securing the work in the latter, knife supporting means movable radially of said chuck means, and power means on said frame operative to move said holding means and said knife supporting means simultaneously into and out of operative engagement with the work, said power means including a cylinder and piston and toggle members actuated by said piston and connected respectively with said holding means and said knife supporting means.

RAY A. SANDBERG.