Aug. 16, 1966 J. J. CERVENKA ETAL 3,266,695

MACHINE FOR APPLYING LUGS

Filed Feb. 24, 1964 5 Sheets-Sheet 1

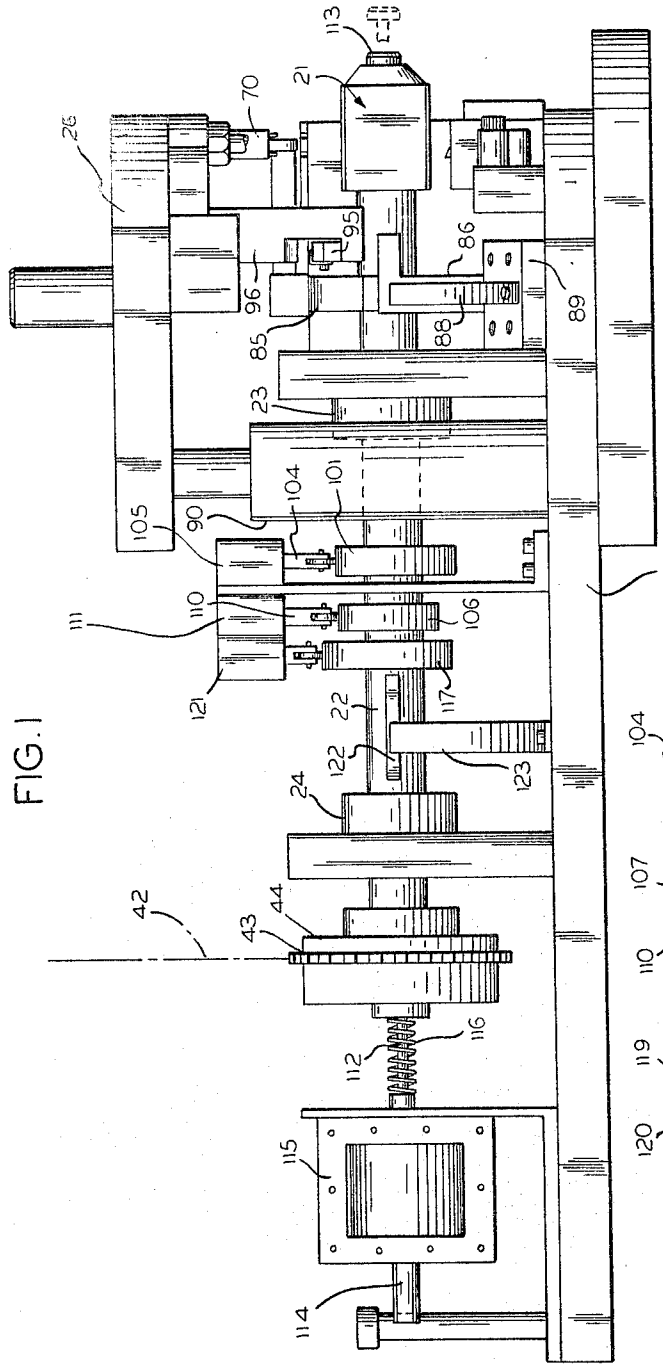


FIG. 1

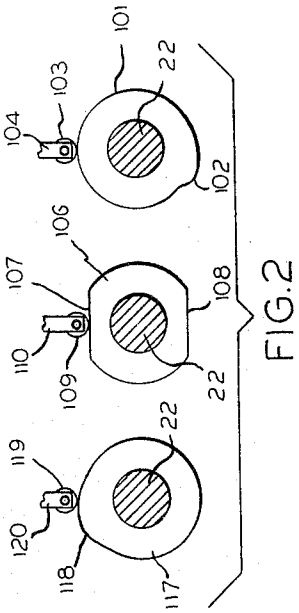


FIG. 2

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MACHINE FOR APPLYING LUGS

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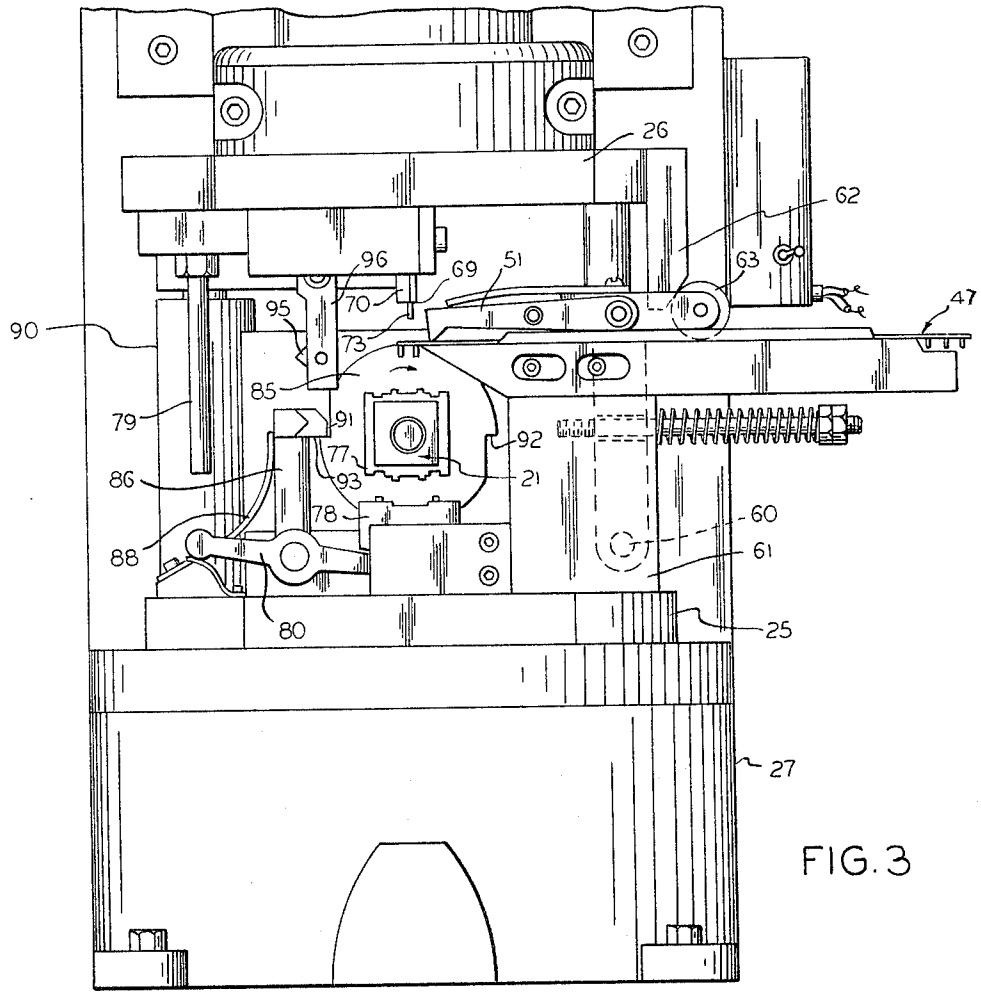


FIG. 3

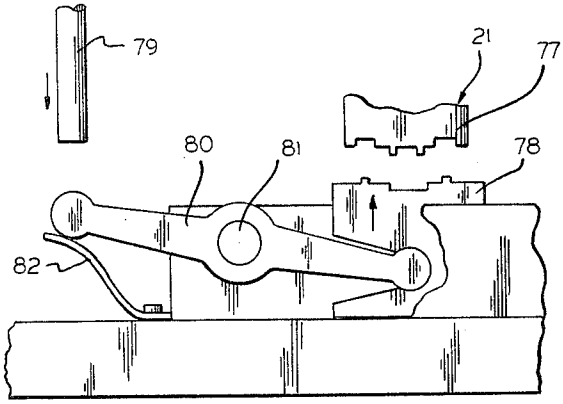


FIG. 4

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MACHINE FOR APPLYING LUGS

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FIG.5

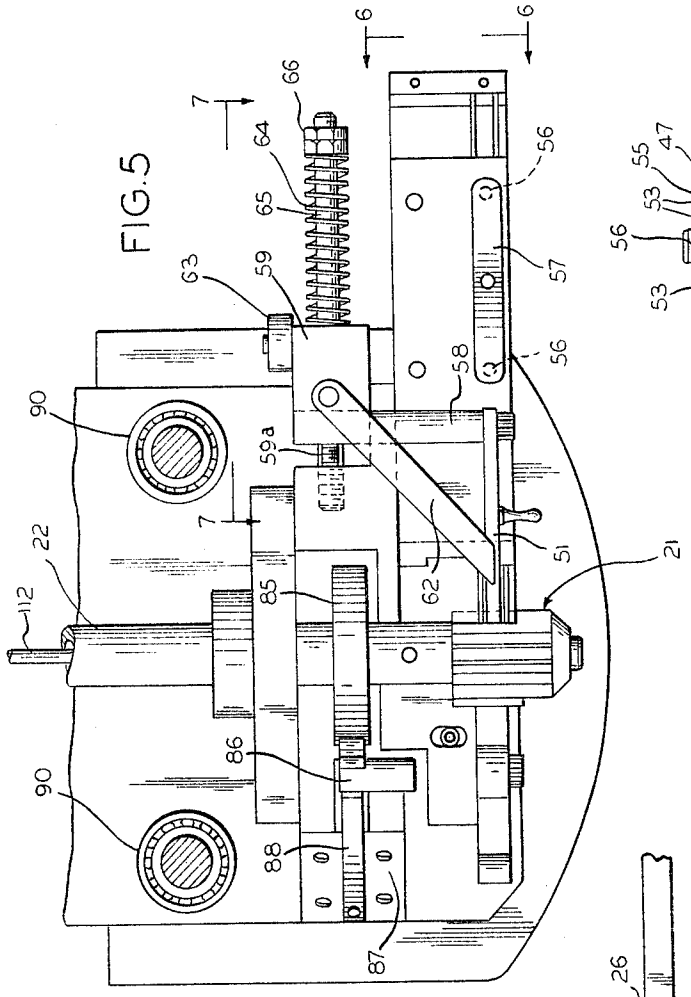


FIG.6

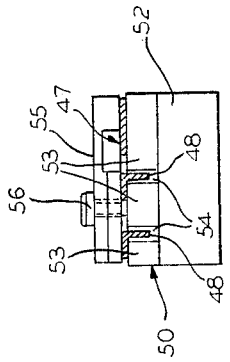
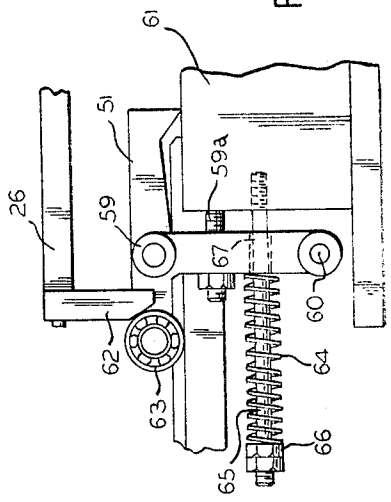


FIG.7



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MACHINE FOR APPLYING LUGS

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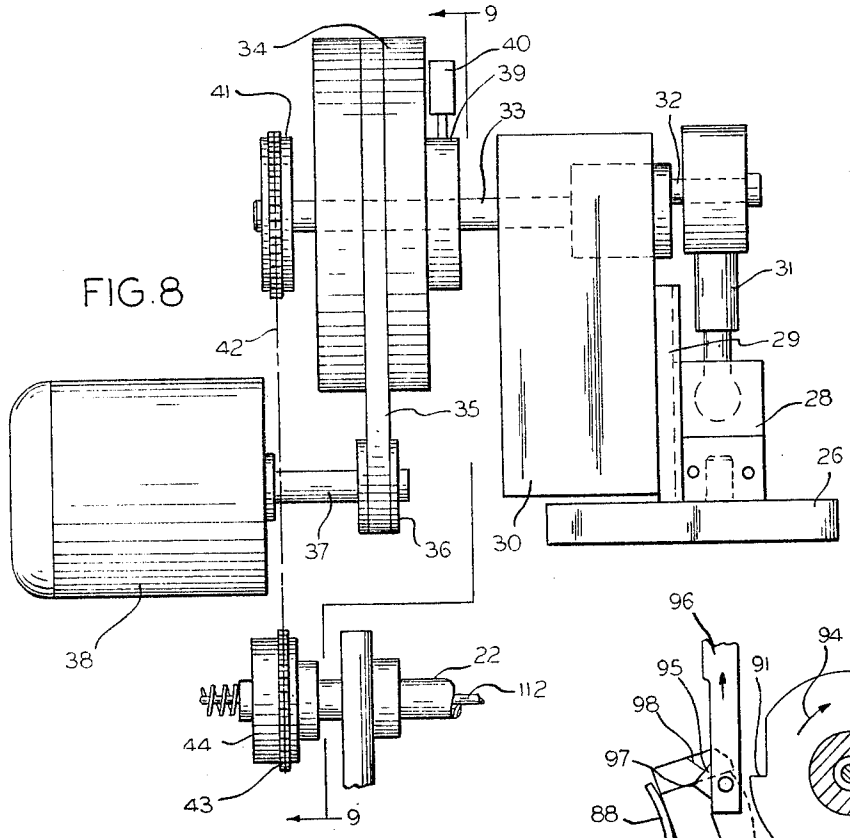


FIG. 8

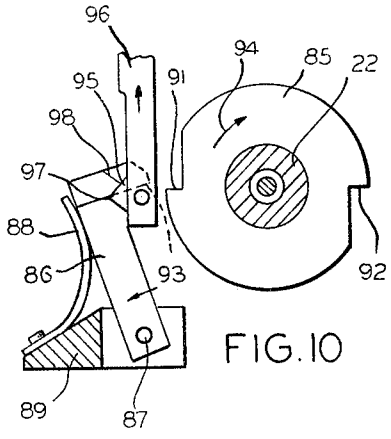


FIG. 10

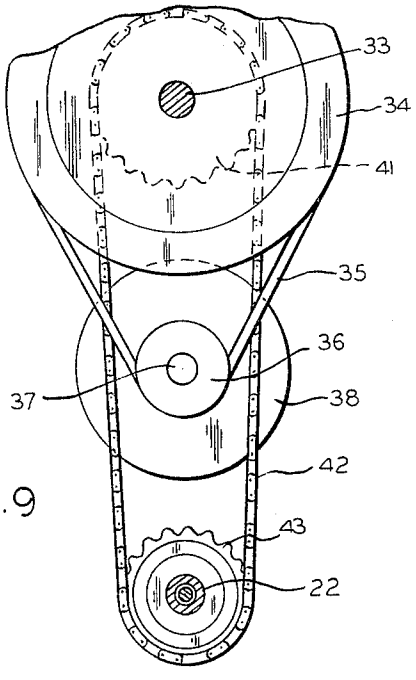


FIG. 9

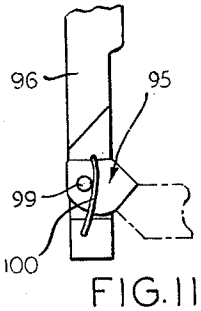


FIG. 11

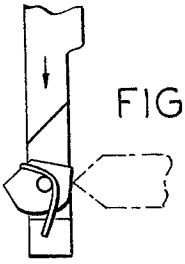


FIG. 12

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MACHINE FOR APPLYING LUGS

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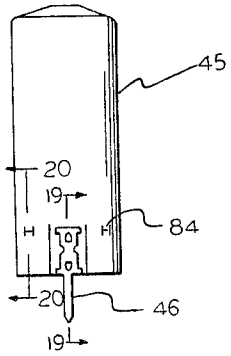


FIG.13

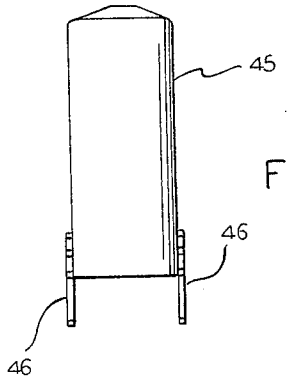


FIG.14

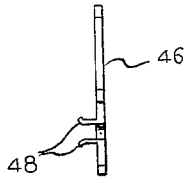


FIG.17

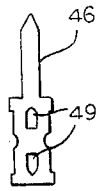


FIG.16

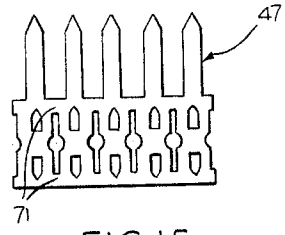


FIG.15

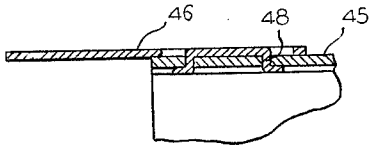


FIG.19

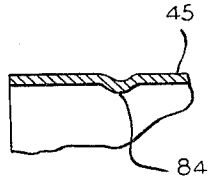


FIG. 20

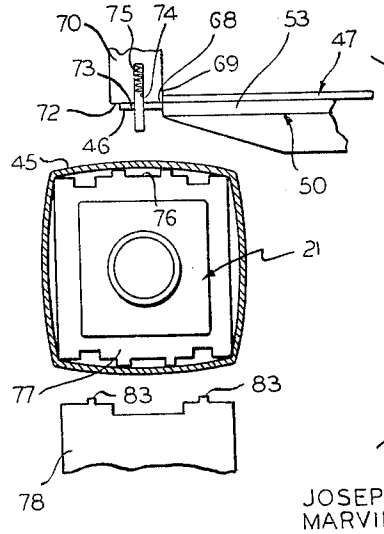


FIG.18

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United States Patent Office 3,266,695 Patented August 16, 1966

3,266,695

MACHINE FOR APPLYING LUGS

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Filed Feb. 24, 1964, Ser. No. 346,791
9 Claims. (Cl. 227—96)

This invention relates in general to a machine for applying lugs or the like to tubular members or the like and more particularly to a machine for successively applying a plurality of lugs to a single tubular member.

The machine of the present invention includes a mandrel upon which a tubular member or the like may be received. The mandrel is supported by a rotatably mounted mandrel shaft. A chain form of lugs is fed to a position in alignment with the mandrel, at which position a punch member first severs a single lug from the chain form of lugs and then stakes or applies the lug to the tubular member. The punch member is mounted on a punch holder reciprocal along the vertical, and the severing and applying steps take place during the downward stroke of the pump member. During the upward return stroke of the punch member, means is actuated for rotating the mandrel shaft and mandrel to another position to thereby bring the tubular member into a successive position for having applied thereto a successive lug. Also on the return stroke of the punch member, the chain form of lugs is advanced to bring another lug into severing and applying position. The mandrel may be indexed to any number of positions automatically for applying any number of lugs to a tubular member. When the desired number of lugs have been applied to the tubular member, an ejector is actuated to eject the tubular member from the mandrel. A forming operation may also be completed on the tubular member while it is mounted on the mandrel, by employing a die form on the mandrel and a movable die member that is actuated through the forming position during the severing and lug applying stroke of the punch member. The punch holder forms a part of a conventional punch press of the type wherein reciprocation thereof is accomplished by a crank and crankshaft arrangement that is selectively clutched to a continually rotating flywheel. The crankshaft is drivingly connected with the mandrel shaft by means of a chain and sprocket arrangement and a friction clutch mounted on the mandrel shaft. Thus power is applied to the friction clutch on the mandrel shaft during clutching engagement between the flywheel and crankshaft. Indexing of the mandrel shaft may be accomplished by a mechanical or electrical trip mechanism which is responsive to the return stroke of the punch member.

The term "lug" as used herein is meant to include any type of element that may be staked or stapled to an electronic shielding can, a coil, or any other type of a member utilizing an element for attaching the member to a frame or chassis. The lug may take the form as shown in the present invention or any other suitable form. Also, the term "tubular member" as used herein is meant to include electronic shielding cans, coils or any other type of a member where it is desired to attach a plurality of lugs thereto.

Accordingly, it is an object of the present invention to provide a machine for successively applying lugs to a tubular member.

Another object of this invention is in the provision of a machine for applying or mounting lugs to tubular members which is simple in construction, economical to maintain, and capable of providing positive movement and accurate positioning of a tubular member for accurate mounting of a lug thereon.

Still another object of this invention resides in the

provision of a machine for applying lugs to a tubular member, wherein any number of lugs may be successively applied to any tubular member in accurate and positive relationship.

A further object of this invention is to provide a machine for successively applying or mounting lugs to a tubular member, wherein the lugs are fed in chain form to a position in alignment with the tubular member and severed therefrom one at a time.

A still further object of this invention is to provide a machine for successively applying or mounting lugs to a tubular member which includes a punch press for operating a punch member, and a rotatably mounted mandrel for receiving the tubular member, wherein the positioning of the mandrel is interrelated with the operation of the punch member so that successive lugs may be automatically applied to a tubular member.

Another object of this invention is in the provision of providing a machine for successively applying lugs to a tubular member, wherein the machine includes a punch press having a crankshaft and crank arrangement for driving a punch member to sever lugs from a chain form of lugs and to mount the lugs on the tubular member, and wherein the tubular member is supported on a rotatably mounted mandrel that is carried on a mandrel shaft, and wherein the crankshaft and mandrel shaft are parallel and axially aligned thereby defining a machine having a relative few number of parts and very compact in nature.

Still another object of this invention resides in the provision of a machine for successively applying lugs to a tubular member, wherein the machine includes a mandrel for receiving the tubular member and for aligning the tubular member relative to a punch member that severs a lug from a chain form of lugs and applies the lugs to the tubular member, wherein means is provided to block or prevent operation of the machine if the mandrel is not properly positioned for a lug mounting operation.

Other objects, features and advantages of the invention will be apparent from the following detailed disclosure, taken in conjunction with the accompanying sheets of drawings, wherein like reference numerals refer to like parts, in which:

FIG. 1 is a side elevational view of that part of the machine of the present invention illustrating the mandrel shaft and related components;

FIG. 2 is a diagrammatic view of the cams mounted on the mandrel shaft that coact with switches for controlling certain operations of the machine;

FIG. 3 is a front elevational view of that part of the machine of the present invention illustrating the mandrel and associated parts;

FIG. 4 is a greatly enlarged detail front elevational view, with some parts broken away to show underlying parts and illustrating the movable die member that coacts with the mandrel for effecting a forming operation on the tubular member held by the mandrel;

FIG. 5 is a top plan view of the lug feeding mechanism and showing its association with the mandrel and other related parts;

FIG. 6 is an end elevational view of the lug feeding mechanism, taken substantially along line 6—6 and looking in the direction of the arrows;

FIG. 7 is an elevational view of the lug feeding mechanism taken substantially along line 7—7 of FIG. 5 and looking in the direction of the arrows;

FIG. 8 is a somewhat diagrammatic and fragmentary view of the machine of the present invention, illustrating the crankshaft arrangement and drive and the interconnection of the crankshaft and the mandrel shaft;

FIG. 9 is an elevational view, taken substantially along line 9—9 of FIG. 8;

FIG. 10 is a somewhat diagrammatic view illustrating

the operation of the latching mechanism that releases the latching cam on the crankshaft for rotation on the mandrel shaft and showing the latch in releasing position;

FIG. 11 is a diagrammatic side elevational view illustrating the operation of the latching pawl during the downward stroke of the punch holder;

FIG. 12 shows a further step in the operation of the latching pawl and how the pawl moves out of position to by-pass the latching arm during the downward stroke of the punch holder;

FIG. 13 is a side elevational view of a shielding can having a lug mounted thereon as applied by the machine of the present invention;

FIG. 14 is another side view of the can of FIG. 13;

FIG. 15 is a section of a chain form of lugs that may be employed for applying to tubular members in accordance with the machine of the present invention;

FIG. 16 is a plan view of a single lug after it has been severed from the chain form of lugs in FIG. 15;

FIG. 17 is a side elevational view of a single lug exemplary of the type that may be employed for mounting on a tubular member in accordance with the machine of the present invention;

FIG. 18 is a somewhat diagrammatic view illustrating the mandrel with a tubular member mounted thereon, the lower die forming member, and the punch member for severing the lug from the chain form of lugs and applying it to the tubular member held by the mandrel;

FIG. 19 is an enlarged detail sectional view taken substantially along line **19—19** of FIG. 13; and

FIG. 20 is an enlarged detail sectional view taken substantially along line **20—20** of FIG. 13.

Referring now to the drawings, the machine of the present invention includes a mandrel **21** suitably mounted on the end of a mandrel shaft **22** which is rotatably mounted in bearings **23** and **24**. The bearings **23** and **24** are supported on a die holder **25** of a die set. A punch holder **26** comprises the other part of the die set. The die holder is suitably secured to a base **27** of a punch press, while the punch holder **26** is suitably secured to a slide block **28**.

Referring particularly to FIG. 8, the slide block **28** is slidably arranged in guides **29** carried on the frame **30** of the punch press, and a crank **31** is connected to and extends upwardly from the slide block **28**. The crank **31** is carried on a crank arm **32** of a crankshaft **33** that is suitably supported on the frame **30** of the punch press. Normally, a flywheel **34** rotates freely on the crank shaft **33**. The flywheel is driven by a V-belt **35** that is trained over the pulley **36** on the motor shaft **37** of a motor **38**. A clutch **39** is provided for locking the flywheel **34** to the crankshaft **33**, and this clutch may be energized in any suitable manner such as by use of a solenoid **40**. An example of the type of punch press that may be used is the Kompac punch press made by Kenco Manufacturing Co. of Los Angeles, California.

A sprocket **41** is mounted at the rear end of the crankshaft **33** for driving the mandrel shaft **22** through a chain or other suitable endless transmission member **42**, and a sprocket **43** of a friction clutch **44** carried on the mandrel shaft **22**. Thus the sprocket **43** is in frictional driving engagement with the mandrel shaft **22**. Further, the sprocket **41** is slightly larger than the sprocket **43** so that the mandrel shaft **22** is driven faster than the crankshaft **33**. Any suitable means may be provided for actuating the solenoid **40** to drive the crankshaft **33** through the flywheel **34**. It will be noted that the mandrel shaft **22** and the crankshaft **33** are in alignment with each other and parallel thereby eliminating any unnecessary parts or components for defining a driving relation between the crankshaft **33** and the mandrel shaft **22**.

The mandrel **21** may be of any desirable shape depending upon the type of tubular member to have lugs mounted thereon, and in the present embodiment the mandrel is substantially square in cross section as seen most clearly in FIG. 18 for receiving thereover a tubular member **45** in the form of a square shaped shielding can. This type of can is generally extruded from aluminum and serves to receive a coil therein and is then mounted on the chassis of an electronic component. As seen in FIGS. 13 and 14, a pair of lugs **46** are mounted on opposite sides of the can **45**, and these lugs serve to secure the can to an electronic chassis component when mounting the can thereon. It should be appreciated that the tubular member or can **45** may take any desirable shape, and it is a purpose of the present invention to facilitate mounting of lugs on tubular members or cans wherein more than one lug is desired to be mounted thereon.

As noted in FIGS. 15–17, a chain form of lugs **47** is provided from which each lug **46** is severed therefrom for application to a tubular member. Each lug **46** includes a pair of ears **48** that are struck from the body of the lug and thereby define a pair of openings **49** therein. In mounting the lugs on the can, the ears **48** are driven through the can and then clinched or bent over as shown particularly in FIG. 19 to permanently secure the lug to the can.

Referring now particularly to FIGS. 3, 5, 6 and 7, the chain form of lugs **47** is fed along a track **50** by a feed pawl **51** to a position where each lug may be severed from the chain form of lugs and then applied to the tubular member held by the mandrel **21**. The track **50** as seen particularly in FIG. 6 includes a base **52** having a plurality of longitudinally extending bars **53** adjustably mounted thereon to define a pair of longitudinally extending grooves **54** through which the ears **48** of the chain form of lugs guidably move. A cover plate **55** is secured over the bars **53** for preventing the chain form of lugs from being displaced along the track **50**. Also a pair of pins **56** extend through the cover plate **55** and are resiliently biased against the chain form of lugs **47** by a spring **57** so as to prevent reverse movement of the chain form of lugs along the track **50** during the non-feed stroke of the feed pawl **51**.

The feed pawl **51** is pivotally mounted on a lateral extension **58** of a feed pawl arm **59** that is in turn pivotally mounted at its lower end on a stub shaft **60**. The stub shaft **60** is in turn mounted on a base member **61** that is carried on the die holder **25**. The feed pawl **59** is resiliently biased downwardly against the chain form of lugs by means of a leaf spring **62** that is secured on the top of the feed pawl arm **59**. The feed pawl **51** is driven through its non-feed or return stroke by means of a cam bar **62** mounted on the punch holder **26**, wherein the cam bar engages a cam follower **63** carried on the feed pawl arm **59** during the downward stroke of the punch holder **26**. The cam follower **63** is a roller that is freely rotatably mounted on the feed pawl arm **59**. The feed pawl **51** is driven in its feed stroke for feeding the chain form of lugs upon the return or upward stroke of the punch holder **26** by means of a strong coil spring **64** that is bottomed at one end on the side of pawl arm **59**, in circling relation with a guide rod **65** and bottomed at the other end on adjustable nuts **66** carried on the guide rod. The feed stroke of the feed pawl **51** and feed pawl arm **59** may be adjusted by means of a setscrew **59*a*** that is adjustably carried by the feed pawl arm **59** and has a free end that engages the base member **61**. Thus, increasing or decreasing of the stroke of the feed pawl **51** may be accomplished by adjustment of the setscrew **59*a***. The guire rod **65** is threadedly received in the base member **61** and extends through a slot **67** formed in the feed pawl arm **59**.

At the discharge end of the track **50** a sharp edge **68** of the bars **53** defines a stationary cutting blade that coacts with a sharp edge **69** on a punch member **70** that is secured to the punch holder **26** for shearing or severing each lug **46** from the chain form of lugs **47**. Thus the sharp edge **69** on the punch member **70** defines a movable cutter blade coacting with the sharp edge **68** for severing the lugs

46 at the points 71 (FIG. 15). The punch 70 has mounted in the lower end thereof in the face 72 a pair of pins 73 that are slidably held in bores 24 of the punch member 70. Springs 75 normally resiliently bias the pins to a projecting position from the face 72. The pins engage and project through the openings 49 in each of the lugs 46 and provide a guide for movement of the lugs toward the tubular member 45. The pins 73 upon engaging the tubular member 45 retract into the bore 74 against the action of the springs 75, while the punch 70 drives the ears 48 through the wall of the tubular member and causes the ears to engage the die face 76 and clinch as shown in FIG. 19. Because the ears 73 must clinch on the tubular member 45 against the face 76, it is extremely important that the mandrel 21 is properly aligned with the punch member 70. Misalignment of the face 76 would cause malfunctioning of the staking operation. Also, it is possible that the face of the die on the mandrel 21 could be damaged.

At the time of the lug severing and staking stroke, this being the downward stroke of the punch member 70 and punch holder 26, a metal forming operation is also performed on the side of the tubular member opposite the side where the lug is applied. It should be appreciated that this metal forming operation may or may not be employed depending upon the particular item being handled by the machine. Exemplary of the metal forming operation is where it is desired to displace that part of the wall of the tubular member 45 which receives the lug 46 so as to assure necessary clearance in the tubular member for receiving internal elements. In this instance, the die 77 on the mandrel 21 coacts with a movable die member 78 arranged beneath the mandrel, FIG. 18. Also referring to FIGS. 3 and 4, the movable die member 78 is slidably mounted for movement along the vertical toward and away from the mandrel 21, and this die member is normally in its non-metal forming position as shown particularly in FIG. 4. The metal forming stroke of the movable die member 78 is accomplished by the downward movement of the punch holder 26 toward the die holder 25, wherein an actuating rod 79 is mounted on the punch holder 26 and engages one end of a rocker arm 80 pivotally mounted at 81. The other end of the rocker arm 80 engages in a socket in the movable die member 78 so that downward movement of the end engaged by the rod 79 effects upward movement of the end engaging the movable die member 78. Upon the return or upward stroke of the punch holder 76, the guide rod 79 leaves the rocker arm 80 and a leaf spring 82 returns the rocker arm 80 and die member 78 to the position shown in FIG. 4. Raised protuberances 83 on the movable die member 78 coact with the die 77 to define indents 84 in the side wall of the tubular member or can 45 which serve as stops for properly positioning an internal element within the can. As previously mentioned, any sort of metal forming operation may be accomplished on one side of the tubular member by the lower movable die member 78 during the downward stroke of the punch holder 26.

During the downward stroke of the punch holder 26, which is effected by actuating the clutch 39 to connect the flywheel 34 and crankshaft 33, rotation of the crankshaft 33 also rotates the sprocket 41 to drive the chain 42 and rotate the sprocket 43. However, the mandrel shaft 22 will not rotate because the friction clutch 44 slips and the mandrel shaft is held against rotation by the coaction of a latching or indexing cam 85 secured to the mandrel shaft 22, and a latch 86 pivotally mounted on a pin 87 (FIG. 10). The latch 86 is normally biased against the latching cam 85 by means of a leaf spring 88 that engages and pushes against the back side of the latch 86 and is secured to the block member 89. The block member 89 is in turn suitably mounted on the die holder 25. In order to assure the proper alignment and movement between the die holder 25 and the punch holder 26, a pair of guides 90 are provided of the usual type. The latching or indexing cam 85 is notched along its surface at diametrically opposite points to define radially extending stops 91 and 92 which when in engagement with the latch abutment 93 of the latch 86, prevent rotation of the mandrel shaft 22. The arrow 94 on the latching cam 85, FIG. 10, indicates the direction of rotation of the shaft 22 and latching cam 85.

In order to swing the latch 86 to a position where the abutment 93 is free from the stops 91 or 92 on the latching cam 85, an unlatching pawl 95 which is pivotally mounted on a pawl arm 96 carried by the punch holder 26 engages a cam surface 97 on the latch 86 and drives the latch 86 into disengaged position relative to the latching cam 85, thereby permitting operation of the friction clutch 44 to rotate the mandrel shaft 22 into the next position and also rotate the mandrel 21 into the next position for application of another lug. As soon as the pawl 95 clears the cam surface 97, the latch 86 will snap back against the latching cam 85 and catch the next stop thereon to again arrest the movement of the mandrel shaft 22 and the mandrel 21. The unlatching pawl 95 is driven into a retracted position on the pawl arm 96 during downward movement of the punch holder 26 in that the pawl engages against a cam surface 98 on the latch 86. A pin 99 pivotally mounts the pawl 95 on the pawl arm 96, and a spring 100 normally forces the pawl 95 to the position as shown in FIG. 11. The pawl 95 is shown in its retracted position in FIG. 12 where it by-passes the latch 86 during the downward stroke of the punch holder 26. The pawl 95 is free to rotate in a counter-clockwise direction from its position shown in FIG. 11, but not in a clockwise direction therefrom, and therefore upon upward movement of the punch holder 26 and the pawl arm 96, the pawl 95 drives the latch 86 to the unlatching position to permit rotation of the shaft 22 and the latching cam 85. Thus, it is seen that a mechanical trip arrangement is employed for releasing the engagement of the latch 86 from the latching cam 85. It should be further appreciated that a solenoid microswitch unit could be employed in place of the mechanical trip unit, wherein the plunger of a solenoid would be connected to the latch 86 in such a way as to rock the latch away from the latching cam 85 upon energization of the solenoid, and where energization is accomplished by the actuation of a microswitch upon the return or upward stroke of the punch holder 26.

It should be appreciated that the latching or indexing cam 85 may have any number of stops thereon for the purpose of indexing any number of times through a 360° revolution so that any number of lugs may be applied to a tubular member held on the mandrel 21. Further, the latching cam 85 and the associated latch 86 may be mounted anywhere along the mandrel shaft 22.

One cycle of the machine is accomplished by actuating a switch that momentarily energizes the solenoid 40 to actuate the clutch 39 and drive the crankshaft 33 through one revolution which moves the punch holder 26 through a downward and upward stroke. Where it is desired to apply a plurality of lugs to a tubular member as is the case with the illustration of FIGS. 13 and 14, a recycling cam 101 is provided with a cam lobe 102 that causes the cam follower 103 of the microswitch plunger 104 to actuate the microswitch 105 which again momentarily energizes the solenoid 40 to cause another cycle of the crankshaft 33 and application of a lug on the opposite side of the tubular member 45. In the event that the mandrel 21 is to be indexed through more than two positions, a like number of lobes would be applied on the recycling cam 101 to cause recycling of the machine.

A safety cam 106 having flat portions 107 and 108 coacts with a cam follower 109 on a microswitch plunger 110 of a microswitch 111. Actuation of the microswitch 111 prevents cycling of the machine if no cycle has been started. The flat portions 107 and 108 are aligned with the mandrel 21 so that the switch 111 will not be actuated when the opposed die faces on the mandrel are in horizontal position as shown in FIG. 3. Again, if more than

one lug applying position is desired, the safety cam **106** would be designed so that cycling could only take place when the tubular member is properly aligned with the punch member **70**. Therefore, this safety cam would eliminate any possibility of damaging the punch member or die face on the mandrel, or any possibility of improperly applying a lug to the tubular member.

At the completion of the lug applying operations on a tubular member, an ejector is actuated to eject the tubular member from the mandrel **21**. This ejector includes an elongated rod **112** extending through a bore in the center of the mandrel shaft **22** and having an enlarged head **113** on the end at the head of the mandrel **21**. The end of the rod opposite the head **113** is connected to a plunger **114** of a solenoid **115** mounted on the die holder **25**. The plunger **114** and the rod **112** are normally urged into the position shown in FIG. 1 wherein the head **113** is in engagement with the mandrel **21** by means of a spring **116**. At the conclusion of one revolution, the solenoid **115** is momentarily fired or energized by an ejector cam **117** mounted on the shaft **22**. This ejector cam is provided with a lobe **118** that engages a cam follower **119** mounted on the end of a microswitch plunger **120** of a microswitch **121**. It should be appreciated that if it is not desired to automatically eject the tubular member at the conclusion of the lug applying operations, the solenoid **115** need only be disconnected from the circuitry.

An additional safety means for preventing reverse rotation of the mandrel shaft **22** when the shaft has the mandrel placed in either of the lug applying positions includes an axially extending groove **122**, FIG. 1, formed in the shaft **22** and in which the upper end of a spring member **123** engages. Any number of grooves may be provided on the shaft and the spring member **123** will permit rotation of the shaft in only one direction when the spring engages in the groove.

In summarizing the operation of the machine, wherein it is desired to apply a pair of lugs **46** to the can **45** as illustrated in FIGS. 13 and 14, a can is first positioned on the mandrel **21**. A start button connected into the electrical circuitry of the machine is pushed, thereby causing downward movement of the punch holder **26**, shearing of a lug **46** from the chain form of lugs **47**, guiding the downward movement of the lug by means of the pins **73** and driving of the ears **48** of the lug through the side wall of the tubular member by the punch member **70** and clinching of the ears as shown in FIG. 19. Also on the downward movement of the punch holder, the cam bar **62** causes retraction of the feed pawl **51** so that a new grip can be had on the chain form of lugs **47**. Also on the downward movement of the punch holder **26**, the unlatching pawl **95** is driven past the cam surface **95** of the latch **86** and placed in position to release the latch during the upward stroke of the punch holder. Finally, the actuating rod **79** through the rocker arm **80** drives the movable die member **78** upwardly to perform a metal forming operation on the side of the tubular member opposite from which the lug is being applied. Upon upward movement of the punch holder **26**, the pawl **95** releases the latching cam **85** by driving the latch **86** out of position so that the friction clutch **44** can connect the mandrel shaft **22** with the sprocket **43** and rotate the mandrel shaft in a clockwise direction as viewed from FIG. 3. As soon as the latching pawl **95** raises out of the range of the cam surface **97** on the latch **86**, the latch **86** is snapped back against the latching cam **85** so that the latching abutment **93** engages the next stop **92** on the latching cam **85** to thereby position the mandrel **21** and the can thereon to a position for applying the other lug **46**. During the initial cycling of the crankshaft **33**, power is transmitted to the friction clutch **44** in an effort to drive the mandrel shaft **22**. Since the latch **86** is in operation against the latching cam **85**, it will not be possible to rotate the shaft **22**, and during this time the friction clutch **44** slips. But as soon as the latch **86** is withdrawn from the latching cam **85**, the mandrel shaft **22** is rotated at a faster speed than the crankshaft **33** for the friction clutch **44** will no longer slip. Further, the crankshaft and friction clutch arrangement will have an effect to properly position the mandrel shaft **22** by the limits of the stops on the latching cam and the latch so as to assure proper orientation of the mandrel **21** and the cam thereon during the lug applying operation.

Also, during the return stroke of the punch holder **26**, the feed pawl **51** is allowed to advance the chain form of lugs **47** so that a lug is properly positioned over the mandrel **21** for the next lug applying operation. At the conclusion of the upward or return stroke of the punch holder **26**, the mandrel shaft **22** will have rotated to cause the ejector cam **117** to operate the ejector microswitch **121** and energize the solenoid **115** to drive the ejector rod **112** in a direction to eject a lugged can by the mandrel **21**. Thereafter, the cycling of the machine may be repeated by applying successive cans on the mandrel **21**.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention, but it is understood that this application is to be limited only by the scope of the appended claims.

The invention is hereby claimed as follows:

1. In a machine for successively mounting a plurality of lugs on a tubular member, said machine including a crankshaft having a crank in coupled engagement with a slidably mounted slide block, means for cycling said crankshaft through one revolution for driving said slide block through a forward stroke and a return stroke, a die set including a punch holder and a die holder, means for connecting said punch holder of said slide block for driving said punch holder through a forward stroke and a return stroke, a mandrel for receiving a tubular member, a mandrel shaft for supporting said mandrel, bearing blocks carried on said die holder for rotatably mounting said mandrel shaft, means on said die holder for supporting a chain form of lugs and for cantileverly supporting the endmost lug in alignment with said mandrel, a stationary cutting blade on said supporting means having its cutting edge aligning between the endmost lug and the next endmost lug, a punch member carried by said punch holder for severing the endmost lug from the chain form and applying it to the tubular member during the forward stroke of the punch holder, said punch member having a cutting blade coacting with the stationary cutting blade, a friction clutch on said mandrel shaft, means for drivingly connecting the friction clutch to said crankshaft whereby rotation of said crankshaft causes rotation of said mandrel shaft, means mounted on said die holder coacting with means on said mandrel shaft for holding said mandrel shaft against rotation, and means operable by said punch member during the return stroke thereof for momentarily releasing said holding means to permit rotation of said mandrel to a new position.

2. In a machine for successively mounting a plurality of lugs on a tubular member, said machine including a crankshaft having a crank in coupled engagement with a slidably mounted slide block, means for cycling said crankshaft through one revolution for driving said slide block through a forward stroke and a return stroke, a die set including a punch holder and a die holder, means for connecting said punch holder to said slide block for driving said punch holder through a forward stroke and a return stroke, a mandrel for receiving a tubular member, a mandrel shaft for supporting said mandrel, bearing blocks carried on said die holder for rotatably mounting said mandrel shaft, means on said die holder for supporting a chain form of lugs and for cantileverly supporting the endmost lug in alignment with said

mandrel, a stationary cutting blade on said supporting means having its cutting edge aligning between the endmost lug and the next endmost lug, a punch member carried by said punch holder for severing the endmost lug from the chain form and applying it to the tubular member during the forward stroke of the punch holder, said punch member having a cutting blade coacting with the stationary cutting blade, a friction clutch on said mandrel shaft, means for drivingly connecting the friction clutch to said crankshaft whereby rotation of said crankshaft causes rotation of said mandrel shaft, means mounted on said die holder coacting with means on said mandrel shaft for holding said mandrel shaft against rotation, means operable by said punch member during the return stroke thereof for momentarily releasing said holding means to permit rotation of said mandrel to a new position, and means operable by said punch member during the return stroke thereof for feeding the chain form of lugs to align the next endmost lug with the mandrel.

3. In a machine for successively mounting a plurality of lugs on a tubular member, said machine including a crankshaft having a crank in coupled engagement with a slidably mounted slide block, means for cycling said crankshaft through one revolution for driving said slide block through a forward stroke and a return stroke, a die set including a punch holder and a die holder, means for connecting said punch holder to said slide block for driving said punch holder through a forward stroke and a return stroke, a mandrel for receiving a tubular member, a mandrel shaft for supporting said mandrel, bearing blocks carried on said die holder for rotatably mounting said mandrel shaft, means on said die holder for supporting a chain form of lugs and for cantileverly supporting the endmost lug in alignment with said mandrel, a stationary cutting blade on said supporting means having its cutting edge aligning between the endmost lug and the next endmost lug, a punch member carried by said punch holder for severing the endmost lug from the chain form and applying it to the tubular member during the forward stroke of the punch holder, said punch member having a cutting blade coacting with the stationary cutting blade, a friction clutch on said mandrel shaft, means for drivingly connecting the friction clutch to said crankshaft whereby rotation of said crankshaft causes rotation of said mandrel shaft, a latching cam mounted on said mandrel shaft and having a plurality of stops thereon, a latch pivotally supported on the die holder having a latching abutment for engaging a stop on the latching cam and holding the mandrel shaft against rotation, and means operable by the punch member during the return stroke thereof for momentarily pivoting said latch out of engagement with said latching cam to release the mandrel shaft for rotation.

4. In a machine for successively mounting a plurality of lugs on a tubular member, said machine including a crankshaft having a crank in coupled engagement with a slidably mounted slide block, means for cycling said crankshaft through one revolution for driving said slide block through a forward stroke and a return stroke, a die set including a punch holder and a die holder, means for connecting said punch holder to said slide block for driving said punch holder through a forward stroke and a return stroke, a mandrel for receiving a tubular member, a mandrel shaft for supporting said mandrel, bearing blocks carried on said die holder for rotatably mounting said mandrel shaft, means on said die holder for supporting a chain form of lugs and for cantileverly supporting the endmost lug in alignment with said mandrel, a stationary cutting blade on said supporting means having its cutting edge aligning between the endmost lug and the next endmost lug, a punch member carried by said punch holder for severing the endmost lug from the chain form and applying it to the tubular member during the forward stroke of the punch holder, said punch member having a cutting blade coacting with the stationary cutting blade, a friction clutch on said mandrel shaft, means for drivingly connecting the friction clutch to said crankshaft whereby rotation of said crankshaft causes rotation of said mandrel shaft, a latching cam mounted on said mandrel shaft and having a plurality of stops thereon, a latch pivotally supported on the die holder having a latching abutment for engaging a stop on the latching cam and holding the mandrel shaft against rotation, means for resiliently biasing said latch against said latching cam, said latch having a tripping cam, and a trip member mounted on said punch member engaging said tripping cam and momentarily rocking said latch out of engagement with said latching cam during the return stroke of said punch member to release the mandrel shaft for rotation.

5. In a machine for successively mounting a plurality of lugs on a tubular member, said machine including a crankshaft having a crank in coupled engagement with a slidably mounted slide block, means for cycling said crankshaft through one revolution for driving said slide block through a forward stroke and a return stroke, a die set including a punch holder and a die holder, means for connecting said punch holder to said slide block for driving said punch holder through a forward stroke and a return stroke, a mandrel for receiving a tubular member, a mandrel shaft for supporting said mandrel, bearing blocks carried on said die holder for rotatably mounting said mandrel shaft, means on said die holder for supporting a chain form of lugs and for cantileverly supporting the endmost lug in alignment with said mandrel, a stationary cutting blade on said supporting means having its cutting edge aligning between the endmost lug and the next endmost lug, a punch member carried by said punch holder for severing the endmost lug from the chain form and applying it to the tubular member during the forward stroke of the punch holder, said punch member having a cutting blade coacting with the stationary cutting blade, a friction clutch on said mandrel shaft, means for drivingly connecting the friction clutch to said crankshaft whereby rotation of said crankshaft causes rotation of said mandrel shaft, a latching cam mounted on said mandrel shaft and having a plurality of stops thereon, a latch pivotally supported on the die holder having a latching abutment for engaging a stop on the latching cam and holding the mandrel shaft against rotation, means for resiliently biasing said latch against said latching cam, said latch having a tripping cam, a trip member mounted on said punch member engaging said tripping cam and momentarily rocking said latch out of engagement with said latching cam during the return stroke of said punch member to release the mandrel shaft for rotation, and means for recycling said crankshaft for successive lug severing and lug applying operations until the mandrel shaft has rotated one revolution.

6. In a machine for successively mounting a plurality of lugs on a tubular member, said machine including a crankshaft having a crank in coupled engagement with a slidably mounted slide block, means for cycling said crankshaft through one revolution for driving said slide block through a forward stroke and a return stroke, a die set including a punch holder and a die holder, means for connecting said punch holder to said slide block for driving said punch holder through a forward stroke and a return stroke, a mandrel for receiving a tubular member, a mandrel shaft for supporting said mandrel, bearing blocks carried on said die holder for rotatably mounting said mandrel shaft, means on said die holder for supporting a chain form of lugs and for cantileverly supporting the endmost lug in alignment with said mandrel, a stationary cutting blade on said supporting means having its cutting edge aligning between the endmost lug and the next endmost lug, a

punch member carried by said punch holder for severing the endmost lug from the chain form and applying it to the tubular member during the forward stroke of the punch holder, said punch member having a cutting blade coacting with the stationary cutting blade, a friction clutch on said mandrel shaft, means for drivingly connecting the friction clutch to said crankshaft whereby rotation of said crankshaft causes rotation of said mandrel shaft, a latching cam mounted on said mandrel shaft and having a plurality of stops thereon, a latch pivotally supported on the die holder having a latching abutment for engaging a stop on the latching cam and holding the mandrel shaft against rotation, means for resiliently biasing said latch against said latching cam, said latch having a tripping cam, a trip member mounted on said punch member engaging said tripping cam and momentarily rocking said latch out of engagement with said latching cam during the return stroke of said punch member to release the mandrel shaft for rotation, means for recycling said crankshaft for successive lug severing and lug applying operations until the mandrel shaft has rotated one revolution, and means for preventing cycling of the crankshaft if the mandrel is not properly oriented for a lug applying operation.

7. In a machine for successively mounting a plurality of lugs on a tubular member, said machine including a crankshaft having a crank in coupled engagement with a slidably mounted slide block, means for cycling said crankshaft through one revolution for driving said slide block through a forward stroke and a return stroke, a die set including a punch holder and a die holder, means for connecting said punch holder to said slide block for driving said punch holder through a forward stroke and a return stroke, a mandrel for receiving a tubular member, a mandrel shaft for supporting said mandrel, bearing blocks carried on said die holder for rotatably mounting said mandrel shaft, means on said die holder for supporting a chain form of lugs and for cantileverly supporting the endmost lug in alignment with said mandrel, a stationary cutting blade on said supporting means having its cutting edge aligning between the endmost lug and the next endmost lug, a punch member carried by said punch holder for severing the endmost lug from the chain form and applying it to the tubular member during the forward stroke of the punch holder, said punch member having a cutting blade coacting with the stationary cutting blade, a friction clutch on said mandrel shaft, means for drivingly connecting the friction clutch to said crankshaft whereby rotation of said crankshaft causes rotation of said mandrel shaft, a latching cam mounted on said mandrel shaft and having a plurality of stops thereon, a latch pivotally supported on the die holder having a latching abutment for engaging a stop on the latching cam and holding the mandrel shaft against rotation, means for resiliently biasing said latch against said latching cam, said latch having a tripping cam, a trip member mounted on said punch member engaging said tripping cam and momentarily rocking said latch out of engagement with said latching cam during the return stroke of said punch member to release the mandrel shaft for rotation, means for recycling said crankshaft for successive lug severing and lug applying operations until the mandrel shaft has rotated one revolution, and means for ejecting the tubular member from the mandrel upon completion of one revolution of said mandrel shaft.

8. In a machine for successively mounting a plurality of lugs on a tubular member, said machine including a crankshaft having a crank in coupled engagement with a slidably mounted slide block, means for cycling said crankshaft through one revolution for driving said slide block through a forward stroke and a return stroke, a die set including a punch holder and a die holder, means for connecting said punch holder to said slide block for driving said punch holder through a forward stroke and a return stroke, a mandrel for receiving a tubular member, a mandrel shaft for supporting said mandrel, bearing blocks carried on said die holder for rotatably mounting said mandrel shaft, means for feeding a chain form of lugs to successively position the endmost lug of the chain form in alignment with said mandrel, a punch member carried by said punch holder for severing the endmost lug from the chain form and applying it to the tubular member during the forward stroke of the punch holder, means coacting with the crankshaft and punch holder for rotating said mandrel shaft a partial revolution to position the tubular member for a successive lug applying operation during the return stroke of said punch member, and a die member on said mandrel coacting with a movable die slidably supported on said die holder to perform a metal forming operation on said tubular member during said lug applying operation, said movable die being driven by said punch holder on its forward stroke.

9. In a machine for successively mounting a plurality of lugs on a tubular member, said machine including a crankshaft having a crank in coupled engagement with a slidably mounted slide block, means for cycling said crankshaft through one revolution for driving said slide block through a forward stroke and a return stroke, a die set including a punch holder and a die holder, means for connecting said punch holder to said slide block for driving said punch holder through a forward stroke and a return stroke, a mandrel for receiving a tubular member, a mandrel shaft for supporting said mandrel, bearing blocks carried on said die holder for rotatably mounting said mandrel shaft, means on said die holder for supporting a chain form of lugs and for cantileverly supporting the endmost lug in alignment with said mandrel, a stationary cutting blade on said supporting means having its cutting edge aligning between the endmost lug and the next endmost lug, a punch member carried by said punch holder for severing the endmost lug from the chain form and applying it to the tubular member during the forward stroke of the punch holder, said punch member having a cutting blade coacting with the stationary cutting blade, a friction clutch on said mandrel shaft having a driving sprocket, a sprocket on said crankshaft, a chain trained over said sprockets whereby rotation of said crankshaft rotates said mandrel shaft, means mounted on said die holder for holding said mandrel shaft against rotation, means operable by said punch member during the return stroke thereof for momentarily releasing said holding means to permit rotation of said mandrel to a new position, and said sprocket on said crankshaft being larger than said driving sprocket to drive the mandrel shaft faster than the crankshaft.

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