Jan. 26, 1937. H. W. WEBB 2,069,052

CASING MACHINE

Filed Sept. 29, 1934 3 Sheets-Sheet 1

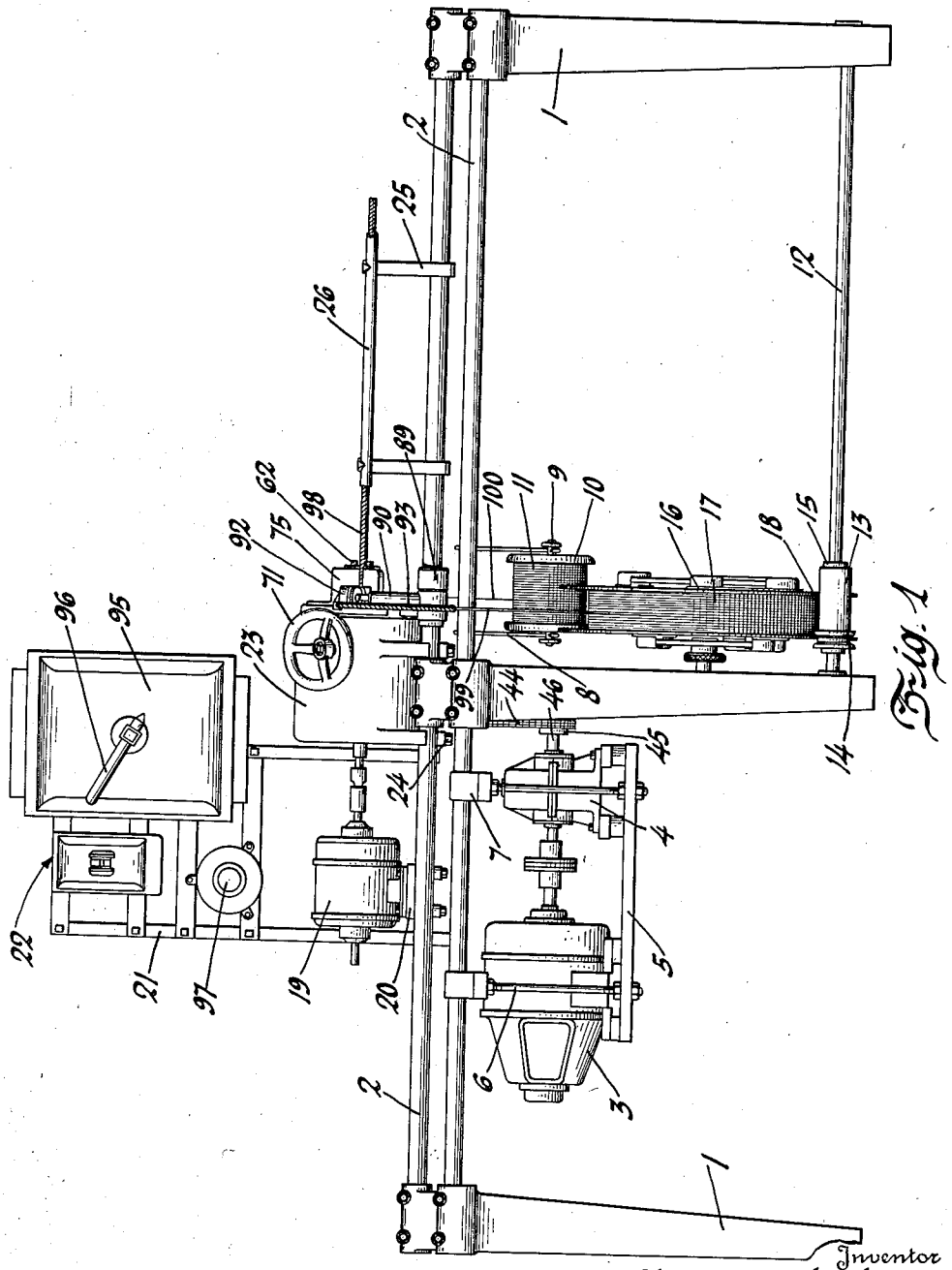


Fig. 1

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Filed Sept. 29, 1934 3 Sheets-Sheet 2

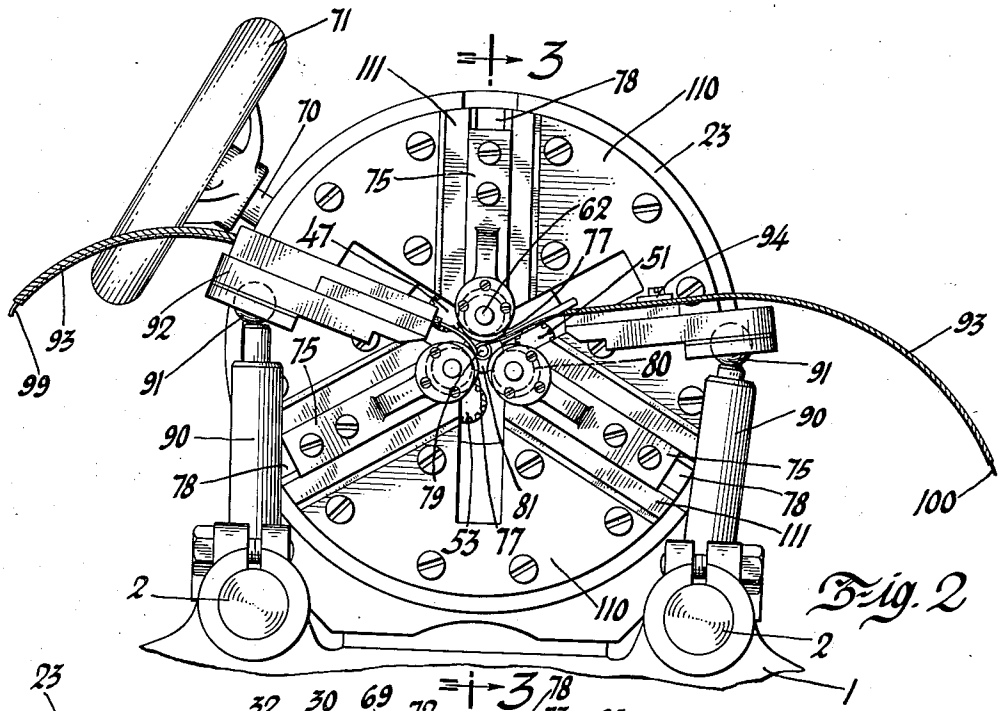


Fig. 2

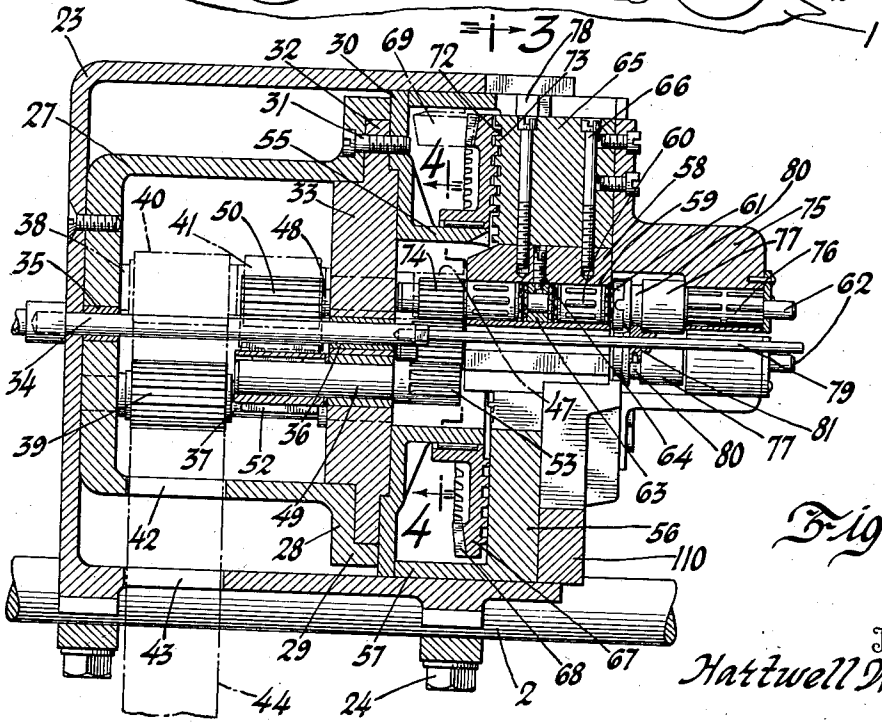


Fig. 3

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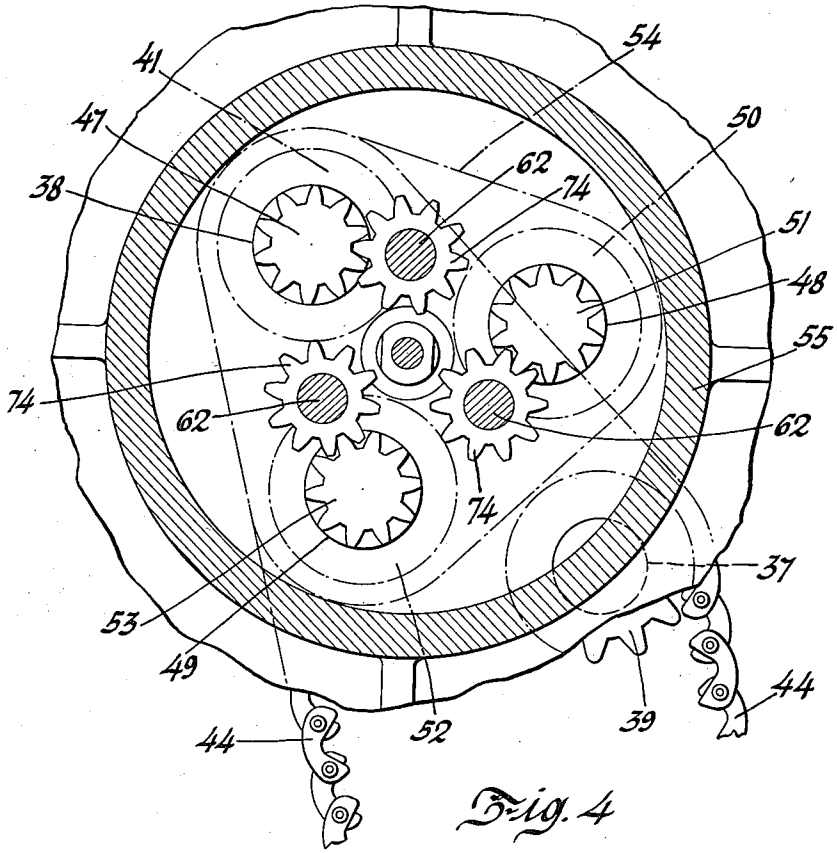


Fig. 4

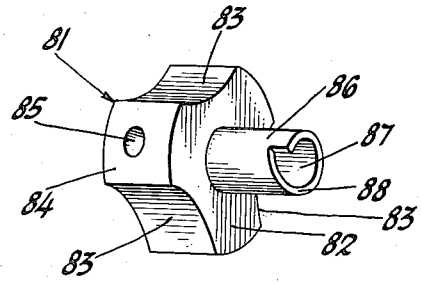


Fig. 5

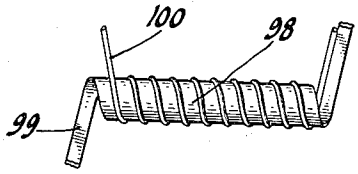


Fig. 6

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UNITED STATES PATENT OFFICE

2,069,052

CASING MACHINE

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17 Claims. (Cl. 113—35)

This invention relates to a machine for making tubular casing, and more specifically to one for making flexible casing for inclosing flexible drive shafts such as those used for automobile speedometers.

Various machines have been used for making flexible casing but most have been large, expensive machines and the casing made thereby has largely been open to the objection that they are not fluid tight and allow the grease and oil, which is necessary to allow the flexible shaft to rotate freely therein, to leak through, which causes grease spots on clothing which comes in contact with the casing. Since speedometers are all mounted on the instrument panel and the tubular casing runs from there to the front floor boards, it is in a position to easily contact the clothing

Flexible casings heretofore made have consisted of a plurality of thin metal bands that were braided or woven together or a plurality of thin metal bands of the same or different shapes wound helically together. The casing made by the present machine consists of a single metal band or strap which is helically wound and a wire also helically wound with the same pitch which is inserted between the adjacent rolls of the band helix to form in the completed article the band and wire alternately. This construction gives a satisfactory fluid tight casing for all installations.

The machine for forming the last mentioned cable includes broadly a plurality of supply spools, one of which feeds the metal band and another the wire, mounted on a frame, a plurality of driving or feeding rollers, axially movable, to roll the supply into circular form and driven by a motor and a small mandrel or spindle located in the center of the driving roll assembly which is driven by a second motor and control apparatus for the two motors.

It is therefore an object of my invention to provide a machine which will make a fluid tight casing.

It is a further object to provide a machine which has two sources of driving power for feeding the stock whose speeds are adjustable with respect to each other.

A still further object is to provide a machine of this type which may, by a few simple adjustments, be made to turn out different sizes of casing.

With the above and other objects in view which will become evident as the description proceeds, my invention resides in the construction as described in the specification, claimed in the claims and illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of my machine.

Figure 2 is a front view of the chuck or head showing the material feeding into the machine.

Figure 3 is a sectional view taken on the line 3—3 of Figure 2.

Figure 4 is an enlarged sectional view taken on the line 4—4 of Figure 3.

Figure 5 is a detail of a bushing which fits between the rolls.

Figure 6 shows a portion of finished casing.

Referring to the drawings, a plurality of legs 1 support the parallel bars 2 which form the frame bed of the machine. There are three pairs of legs, one at each end of the bars and one in substantially the middle. Supported on the lower bar between the central legs and the rear is a driving motor 3 and a reduction gear assembly 4 which are mounted on a platform 5 slung from the bar by a series of long bolts 6 secured to the clamping members 7 on the bars.

Hung from the same bar just to the other side of the central legs by a pair of heavy bent wires 8 is a pin 9 which passes through the central opening in a spool 10 upon which is wound the supply of wire 11 for the machine. Between the center and front legs are secured two parallel rods 12 near the base, and on these rods near the inner end are rotatably mounted round sleeves 13 which have two raised rims 14 at one end with a groove between them, the base of the groove having the same diameter as the main surface of the sleeve. The sleeve is kept from endwise movement on the sleeve by two disks 15 secured to the rod. A large drum 16 upon which the supply of metal banding or strip 17 is wound is supported by having its rims 18 seated on these two spaced sleeves near the bottom of the drum, one rim engaging the plane surface of the sleeve and the other the groove, the purpose of the groove being to prevent the drum from moving endwise. As the metal band is pulled from the drum it will rotate, which will rotate the sleeves on the rods. The weight of the drum is sufficient to maintain its position on the sleeves without other securing means.

On top of the bars 2 is supported a second driving motor 19 by suitable clamping means 20. Also carried adjacent the second motor is a frame 21 which supports the control apparatus for the motors and indicated generally at 22. Just ahead of the motor 19 and directly over the cen-

tral legs is a housing 23 secured to the bars by bolts 24. This housing carries the driving gears for the rolling and feeding mechanism and will be described in detail at a later point. Brackets 25 support a metal tubing 26 on the forward portion of the bars through which the casing is led as it is fed out.

The housing 23 is substantially a cylindrically shaped casing, one end of which is closed. Secured to the closed end is a cup-shaped member 27 whose axis coincides with that of the casing. The forward edge of this member is flanged outwardly as at 28 and then forward for a short distance as at 29. A circular plate 30 contacts the forward extension 29 and is secured thereto by bolts 31. Clamped within the annular opening provided by the flange 28 is the rim 32 of a bearing plate 33 which is also secured by the bolts 31. This bearing plate divides the housing into two practically equal compartments.

A shaft 34 extends through the housing and is supported by two bearings 35 and 36 in the cup-shaped member and bearing plate respectively on the axis of the housing, and is driven by the motor 19. Also supported in the base of the cup-shaped member and the bearing plate are two spaced parallel shafts 37 and 38, the shaft 37 having an idler gear 39 mounted thereon. The shaft 38 has two driving gears 40 and 41 mounted thereon between the cup base and bearing plate. The cup member 27 has an opening 42 in the lower portion and the outside casing 23 also has an opening 43 therein. A chain drive 44 passes through these openings and over the gears 39 and 40. This chain is driven by a gear 45 on the shaft 46 which extends from the reduction gearing 4.

The shaft 38 is spaced to one side and above the shaft 34, which passes through the center, and has its forward end projecting for a short distance through the bearing plate 33 and has gear teeth 47 cut therein. Projecting through the bearing plate, spaced the same distance from the axis thereof as shaft 38, and 120° apart circumferentially, are two more shafts 48 and 49 forming with shaft 38 an equilateral triangle with the shaft 34 as the center. Both shafts project on both sides of the plate and are supported by bearings in the plate. Shaft 48 supports a gear 50 on its rear projection and has gear teeth 51 cut on its forward end. Shaft 49 supports a gear 52 on its rear projection and has gear teeth 53 cut on its forward end. The three gears 41, 50 and 52 have an endless chain drive 54 passing around all three and shown in dotted lines on Figure 4 which drives the shafts 48 and 49 in the same direction and with the same speed as shaft 38 which acts as the driver being driven itself, as we have previously seen, by the gear 40 and the chain 44.

The plate 30 has a large central opening therein which is surrounded by an upstanding flange 55 which extends parallel to the axis of the housing, and surrounds the toothed ends of the shafts 38, 48 and 49. A heavy chuck body 56 is positioned in the housing in front of the circular plate and flange, and has a circular flange 57 at its periphery which extends toward the rear and forms an enclosure with flange 55, the purpose of which will be presently set forth. The chuck body has three radial openings therein that are relatively narrow and spaced at 120° apart. Within each of these openings is positioned a block 58, each of which has a longitudinal circular opening 59 through the innermost portion thereof. Supported within this circular opening are bearings, both horizontal 60 and thrust 61 for supporting three parallel shafts 62. Between the two central thrust bearings is a spacer 63 held in place by a set screw 64. Radially outward in each slot above the block 58 is a second block 65 which extends nearly out to the housing. The two blocks are held together by long cap screws 66.

A large bevel gear 67 rotates upon the outer surface of the flange 55, the teeth 68 at an angle to the outer end engage with the teeth on a bevel gear 69 supported on a stub shaft 70, which extends through the housing and has a hand wheel 71 on the outer end. The forward face of the circular portion connecting the hub of the gear 67 with the toothed rim has scroll teeth 72 thereon which engage with a similarly threaded portion 73 on the inside edge of blocks 65 to move the blocks 58 and 65 together inward or outward upon rotation of the gear 67 by the hand wheel and gear 69, which is shown in Figure 3 approximately 60° from its normal position of drive and therefore is illustrated by dotted lines. The structure of the chuck head and means for moving the movable jaws is standard construction and as such forms no part of my invention.

To the inner ends of each of the shafts 62 is secured like gears 74 which mesh with the toothed ends 47, 51 and 53 of the shafts 38, 48 and 49 respectively, but are placed at one side thereof so that the gears 74 may be moved radially of the housing, which will of course disengage the teeth if moved far enough. The radial movement allowed while driving connection is still maintained will be dependent upon the depth of the teeth, and since the movable gear moves tangentially past the stationary it will engage the edges of the teeth, then the correct full mesh and then out to the edges and finally disengage. This adjustment will, of course, not be large but it is sufficient to allow the making of most practical sizes of casing.

Angled brackets 75 are secured to the forward faces of each of the blocks 65 and support a bearing 76 for the outer end of the shafts 62. Behind the bearing the bracket is cut away to provide an opening for a roller 77 mounted on the shaft to rotate therein. The front face of the chuck is formed of three sector plates 110 spaced from each other to leave radial guideways 78, each of the radial edges of the sectors having offset lips 111 which extend over the brackets 75 to keep them in place. Each whole shaft assembly may then be moved radially in each groove.

The forward end of shaft 34 which projects through the bearing plate is drilled and tapped and supports the inner end of a mandrel or spindle 79 lying on the axis of the housing, and which projects from the front thereof. Each of the rollers 77 has a square groove 80 cut in the face near the rear, and supported within these grooves when all three shafts 62 are fed in to the center is an angular shaped bearing member 81 through which the mandrel 79 passes. The particular construction of the bearing member is best shown in Figure 5, where it can be seen that the member is formed of an originally circular cylinder 82, from which three circular scallops had been removed leaving the circular portions 83, the centers of the indentured being 120° apart. The radius of the curves 83 is the same as that of the rollers. In each of the rounded surfaces 84 is drilled a hole 85 to allow insertion of means

to prevent the bearing from turning when in position. A small tubular portion 86 made integral with the member 82 extends from one face, and an opening 87 through the center of the bearing is the same size as the outside diameter of the spindle. The outer end of the tubular portion is made in the form of a helical spiral 88 to give the correct feeding pitch to the material as it is wound on the spiral. When the rollers are fed in toward the center of the housing by the scroll screw, the portion 82 fits in the roller grooves 80, since it is of the same width and the circular surface 83 fits up adjacent the base of the groove. In operation of the machine, the bearing is stationary and the spindle rotates within it and the rollers rotate adjacent the outside surface.

Secured to the bars 2 in front of the chuck by suitable press fitted sleeves 89 are two upstanding posts 90, the top portion of which is a ball 91. Frictionally secured to the top of each ball by any desired clamping means is an arm 92 which supports a section of hollow flexible cable 93 secured thereto by a screw and clamp 94. Through these two cables are led the wire and the metal band to guide them both to a position adjacent where they are wound on the spindle. The arms may be set at any practical position with respect to the posts, since the joint is purely frictional on the ball and the posts may be moved in a rotary path around the bars if the clamp is not too tight.

The control panel includes a controller 95 having a switch handle 96 which supplies current to both motors, and also a rheostat 97 which acts to adjust the speed of the mandrel motor 19 to get the peripheral speed of the mandrel and rolls the same.

The operation of the device will be briefly described. The operator first decides upon the size of cable that he desires to make and then chooses the small bearing member 81 of that size. The correct spindle is screwed into the shaft and the bearing member slid on the spindle and the handwheel 71 rotated to feed the rollers in radially until the grooves in the rolls are engaged by the parti-circular portions on the bearing member. In this position, the rollers are spaced from the periphery of the spindle approximately the thickness of the wire band. Then the band is fed in through one cable to the rollers and the wire through the other cable to the same point adjacent the side of the band. The two are fed in side by side adjacent the helically shaped end 88 of the bearing member which will give them the proper pitch. The switch 96 is then thrown, which starts both the motors 3 and 19.

The motor 3 drives the gear reducer 4 which in turn drives the shaft 38 through the chain drive 44. The opposite end of the shaft is toothed and drives the gear 74 on the shaft 62 to drive one roller, the other two rollers being driven in a similar way at the same speed and in the same direction by an endless chain drive 54 over shafts 48 and 49 from shaft 38. The motor 19 drives the spindle or mandrel 79 substantially directly. When the material is being rolled between the rollers and the spindle, it is important that the two be rotating at the same speed so the rheostat 97 is provided to vary the speed of the motor 19 and then vary the speed of the spindle until the peripheral speed is substantially the same as that of the rollers.

As the band and wire are fed into the machine side by side, they are then rolled out to form the tubular casing 98 best shown in the detail in Figure 6, which is formed alternately of band 99 and wire 100. As the cable is formed, it is pressed laterally from the machine and is fed into the supporting tube 26 to carry it away.

As the load on the motors increases, both will slow down, or if the material jams both will stop, which will prevent a tearing or maladjustment of the machine since they both take their part of the load, and if jammed the material would probably be between the two points driven by each motor.

It will be clear, therefore, that I have provided an efficient machine for making flexible tubular casing which is adjustable for different sized cable, and also provided suitable driving devices so that the relative speeds may be adjusted.

I claim:

1. In a casing machine having a supply of unformed material, rotating means upon which the material may be formed, a plurality of other rotating means adjacent to and coacting with the first named means to feed the material and press it against the first named means, and means for independently varying the speed of one rotating means with respect to the other during the forming operation.

2. In a casing machine, a chuck, a plurality of parallel shafts adjustably supported within the chuck, each shaft being supported at spaced points, means for driving the shafts at different positions, feeding rollers on the shafts between the points of support and means to adjust the shafts to roll different sizes of casing.

3. In a casing machine, a chuck, a plurality of parallel shafts movably supported within the chuck, each shaft being supported at spaced points, means for driving the shafts, material feeding means on the shafts between the points of support and means to move the shafts to roll different diameters of casing.

4. In a casing machine, a chuck, three parallel shafts equally spaced from and around the axis of the chuck, means for moving the shafts bodily radially of the chuck, drive means to rotate the shafts, a feed roller secured to each shaft and a mandrel extending parallel with the shafts on the axis of the chuck, and means for driving the mandrel comprising an independently adjustable source of power whereby material may be rolled between the rollers and the mandrel to form a casing.

5. In a casing machine, a chuck having a plurality of equally spaced radial slots therein, means movable within the slots, a shaft carried by the means parallel to the axis of the chuck, means for moving each of the carrying means radially simultaneously, said means including a gear supported by the chuck, a scroll thread thereon engaging the carrying means and exterior means for operating the gear, and feed rollers on each shaft for rolling stock.

6. In a casing machine, a cylindrical housing, a plurality of parallel shafts adjustably supported in equally spaced positions around the axis of the housing, gears secured to one end of the shafts, an equal number of stub shafts supported within the housing and engaging the gears, said adjustable shafts movable in a plane tangent to a circle whose center is the axis of the engaging stub shaft, and means for driving all the stub shafts at the same rate and in the same direction.

7. In a casing machine, a cylindrical housing, a plurality of parallel shafts adjustably supported

in equally spaced positions around the axis of the housing, gears secured to one end of each shaft, an equal number of stub shafts supported within the housing and engaging the gears, said adjustable shafts movable in a plane tangent to a circle whose center is the axis of the engaging stub shaft, additional gears on the opposite ends of the stub shafts, and an endless chain touching a part of each last mentioned gear and surrounding the whole whereby they will all be driven in the same direction and with the same speed.

8. In a casing machine, a chuck, a plurality of parallel shafts adjustably supported within the chuck, a portion of each projecting through the same, means for driving the shafts, rollers on the shaft portions that project through the face of the chuck, a rotatable mandrel supported in the chuck, means held between the rollers acting as a bearing for the outer end of the mandrel, separate means for driving the mandrel, supporting means for supply materials, and guide means for bringing the material to the rollers whereby the material is rolled between the rollers and the mandrel to form the casing.

9. In a casing machine, a housing, a plurality of parallel shafts supported therein that are radially movable of the housing, means to move all simultaneously, a separate rotatable spindle in the center of the housing and a plurality of shafts, rollers on the forward portion of the shafts having grooves in the faces thereof, a bearing through which the spindle projects supported in the grooves in the rollers as they are fed in radially, means to drive the rollers and parallel shafts comprising a plurality of stub shafts supported in the housing which engage gears on the shafts and are in turn driven by an endless chain over all the stub shafts, and a chain drive to a motor shaft from one of the stub shafts, a separate motor driving the central spindle and means for adjusting the speed of the latter motor with respect to the first motor whereby the rollers and the spindle may be made to travel at the same speed.

10. In a casing machine, a chuck having a plurality of radial openings therein, blocks within the openings, means to move the blocks radially in the openings including a scroll thread on a gear operated from outside the chuck, a plurality of parallel shafts carried by the blocks, rollers on the ends of the shafts extending from the chuck, a rotatable spindle extending through the center of the chuck, bearing means carried by the rollers for the outer end of the spindle, means extending from the bearing means having a helical spiral to give feeding pitch to the material as it is rolled, a motor for driving the parallel shafts, a second motor for driving the spindle, means to control the two simultaneously, and separate means to regulate the speed of the second with respect to the first whereby the rollers and spindle will rotate at the same speed.

11. In a casing machine, a chuck, a plurality of shafts adjustably supported in the chuck, a mandrel rotatably supported in the chuck parallel to the shafts, rolling means on the shafts and a bearing member for the mandrel supported solely by the rolling means.

12. In a casing machine having a supply of unformed material, a rotating mandrel upon which the material may be formed, a plurality of rotating rollers to feed the material and press it against the mandrel, separate means for driving the mandrel and the rollers and means for varying the speed of the mandrel with respect to that of the rollers.

13. In a machine of the class described, a thick circular member having a plurality of radial slots therein, means in each slot adapted to be moved radially, spaced bearings carried by the innermost portion of each movable means, rotatable shafts carried in the bearings and rolling means mounted on the shafts between the bearings whereby high roller pressures may be withstood by the spaced bearings.

14. In a machine of the class described, a cylindrical casing, a circular member supported therein having a plurality of radial slots therein, relatively movable means in each slot, means for moving all of the movable means simultaneously radially, spaced bearings in each movable means, shafts carried by each set of bearings, rollers on each shaft between the bearings and a rotating mandrel supported in the center of the circular member and adapted to cooperate with the rollers to form material.

15. In a machine of the class described, a cylindrical casing, a circular member supported therein and having a plurality of radial slots, adjustable blocks in the slots, means in the casing for moving the blocks simultaneously radially, spaced bearings on the inner face of each block, shafts carried in each set of bearings, rollers secured to the shafts between the bearings, a gear on the inner end of each of the shafts, stub shafts fixedly mounted in the casing having toothed ends engaging the shaft gears and each stub shaft so positioned with respect to the carried shaft that any radial movement or adjustment of the latter will be in a plane tangent to a circle whose center is the axis of the stub shaft.

16. In a machine of the class described, a cylindrical casing, a plurality of parallel shafts adjustably supported in the casing, gears secured on one end of the movable shafts, an equal number of stub shafts rigidly supported within the housing to drive the gears, the relation of the movable shafts to the stub shafts being such that any movement of one of the movable shafts is in a plane tangent to a circle whose center is the axis of the stub shaft.

17. In a machine of the class described, a plurality of radially movable shafts supported in the housing, a plurality of fixed parallel stub shafts each associated to drive one of the movable shafts, teeth cut on the stub shafts, gears engaging the teeth secured to the movable shafts, said movable shafts being so positioned that the radial movement thereof will be in a plane tangent to a circle whose center is the axis of the associated stub shaft.

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