May 6, 1952 R. C. ANDERSEN 2,595,747

TUBEMAKING MACHINE

Filed May 16, 1947 5 Sheets-Sheet 1

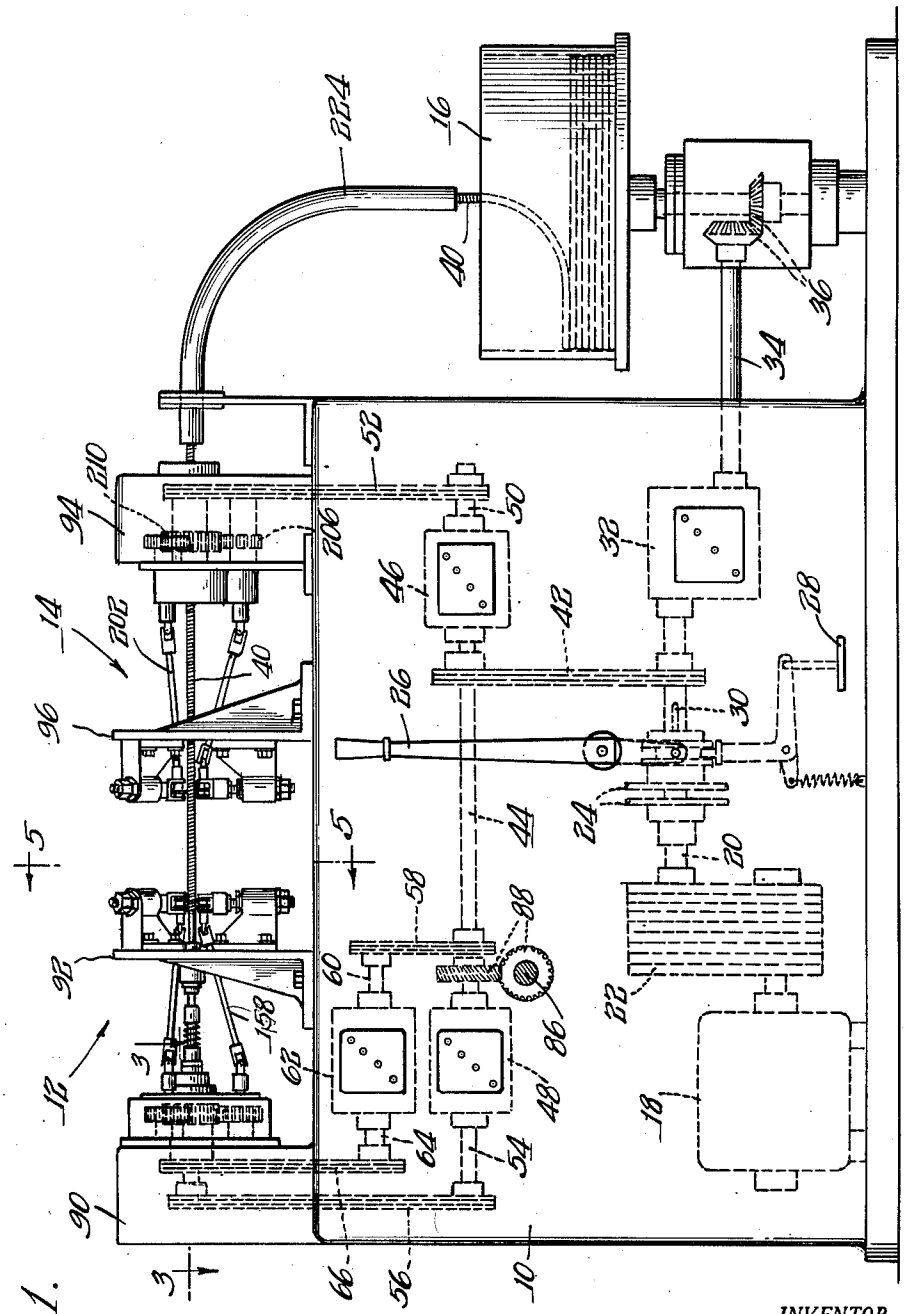


Fig. 1.

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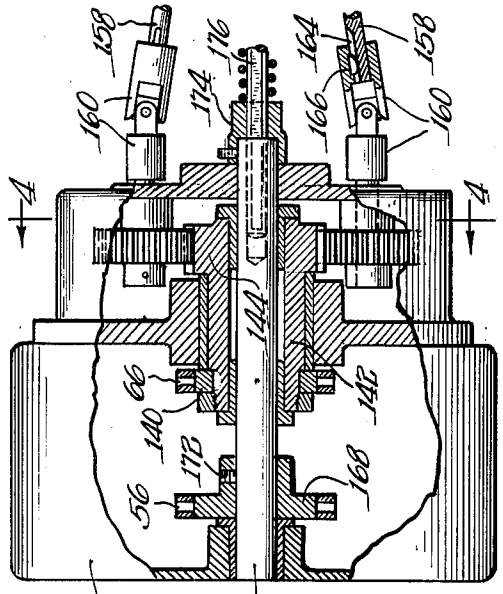


Fig. 3.

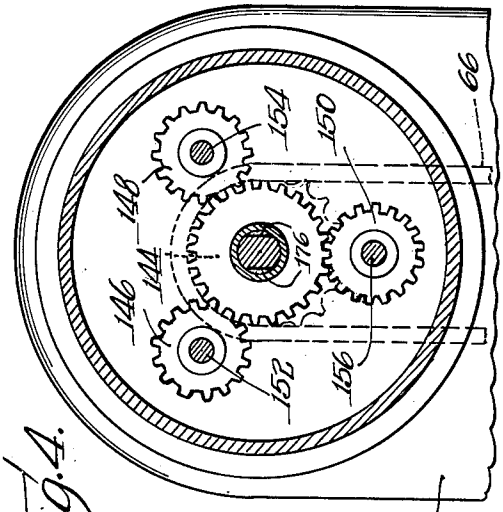


Fig. 4.

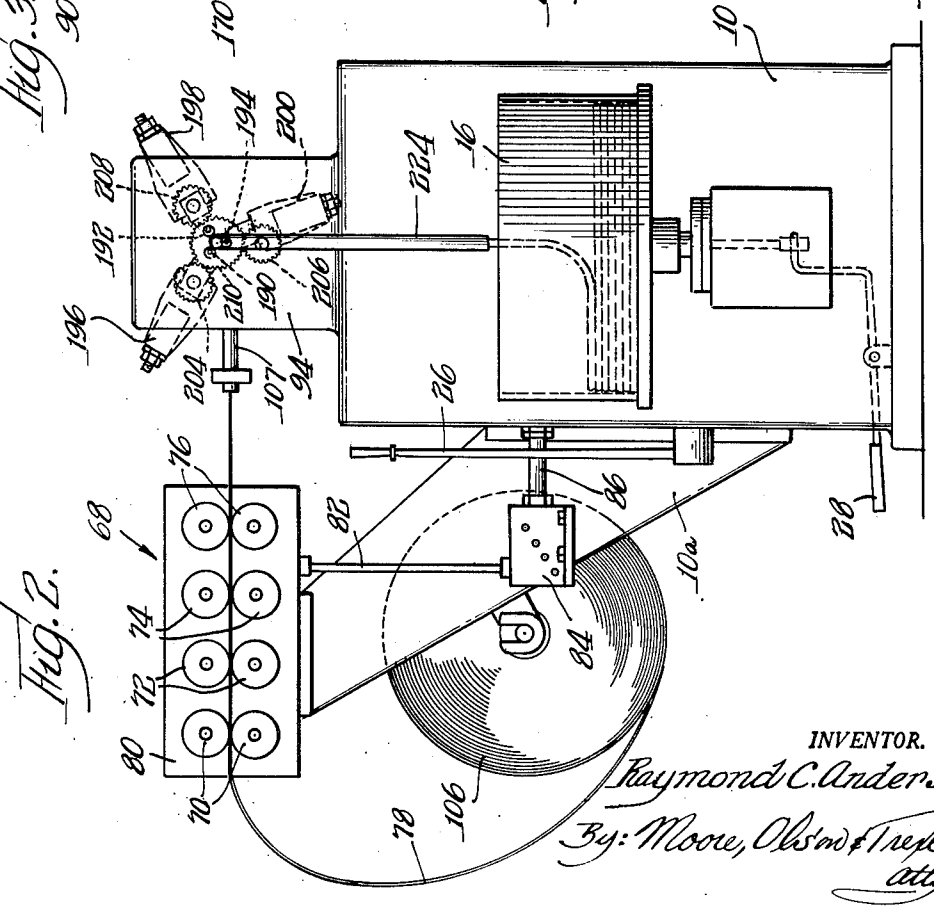


Fig. 2.

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TUBEMAKING MACHINE

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Fig. 5.

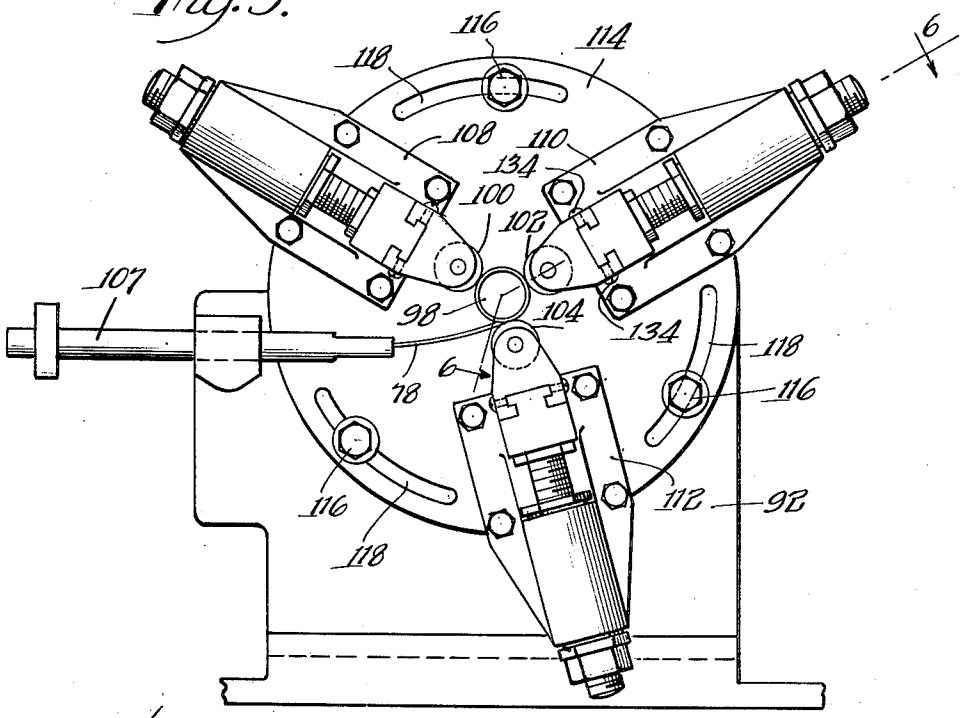


Fig. 6.

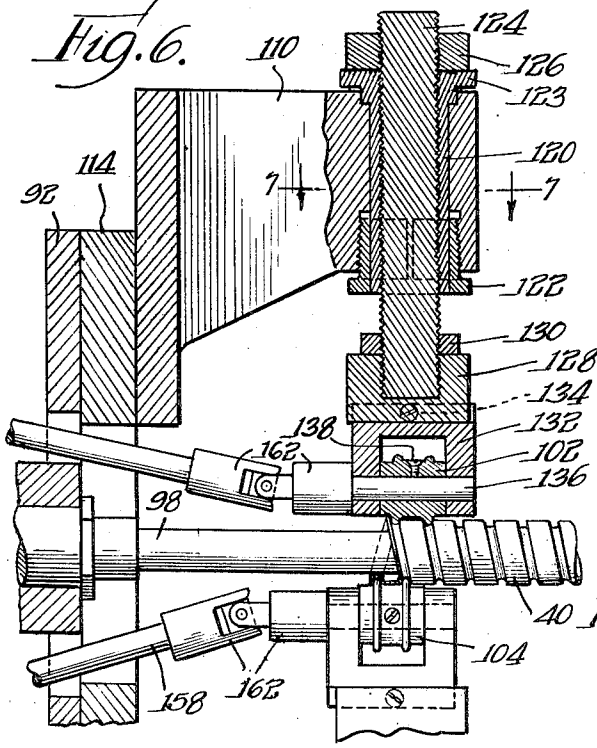
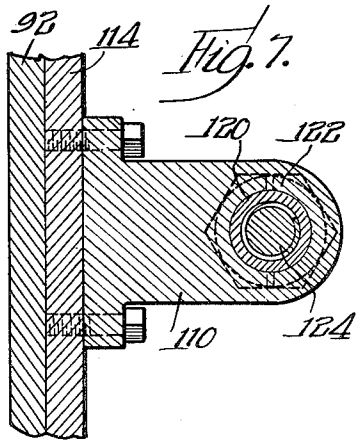


Fig. 7.



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TUBEMAKING MACHINE

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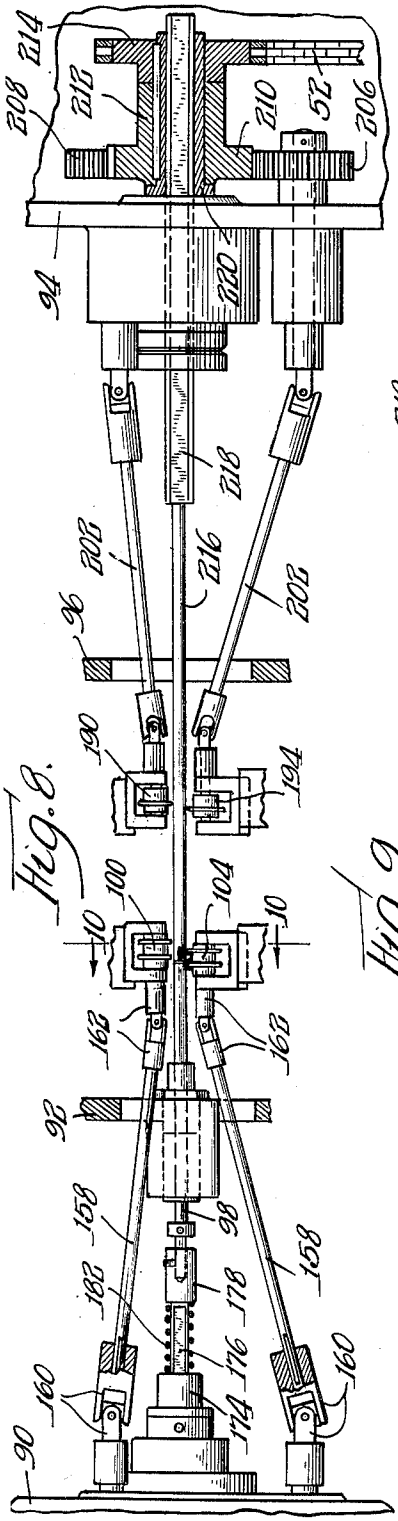


Fig. 6.

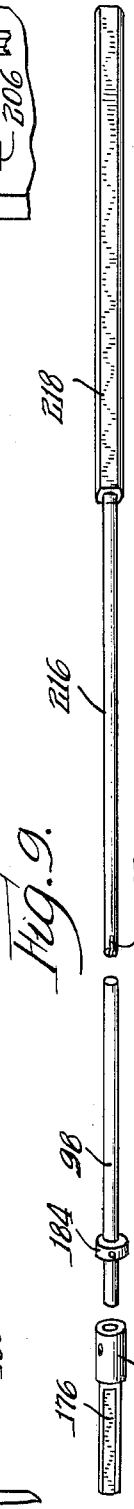


Fig. 9.

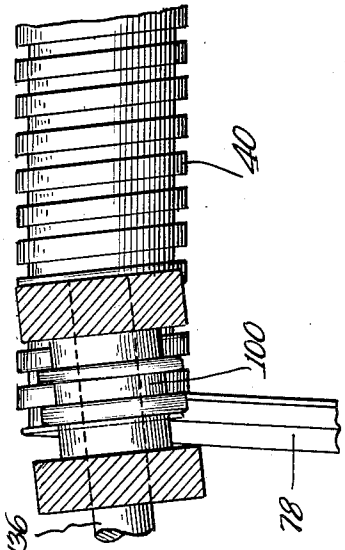


Fig. 11.

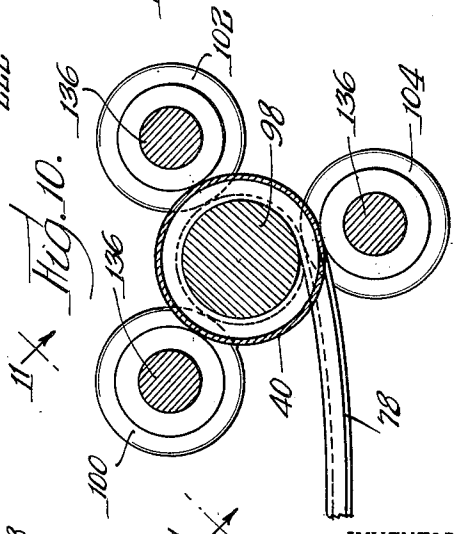


Fig. 10.

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TUBEMAKING MACHINE

Filed May 16, 1947 5 Sheets-Sheet 5

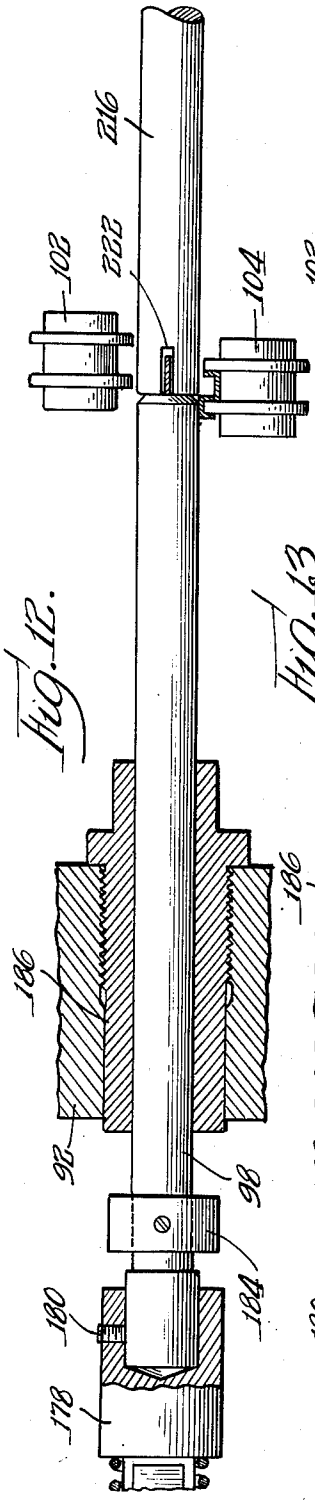


Fig. 12.

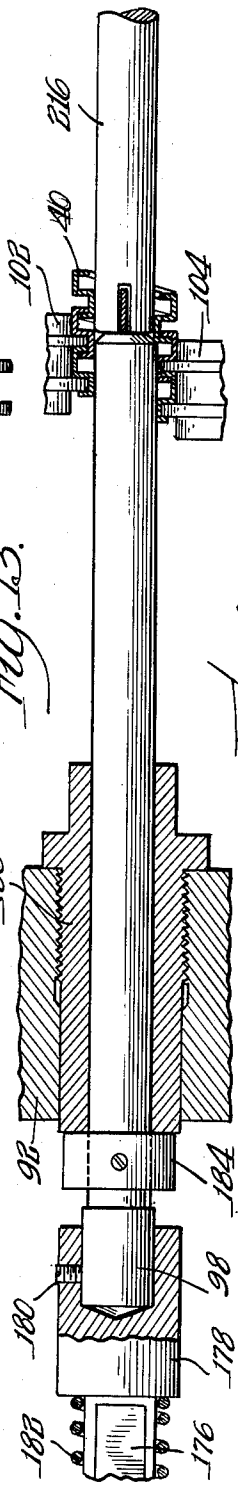


Fig. 13.

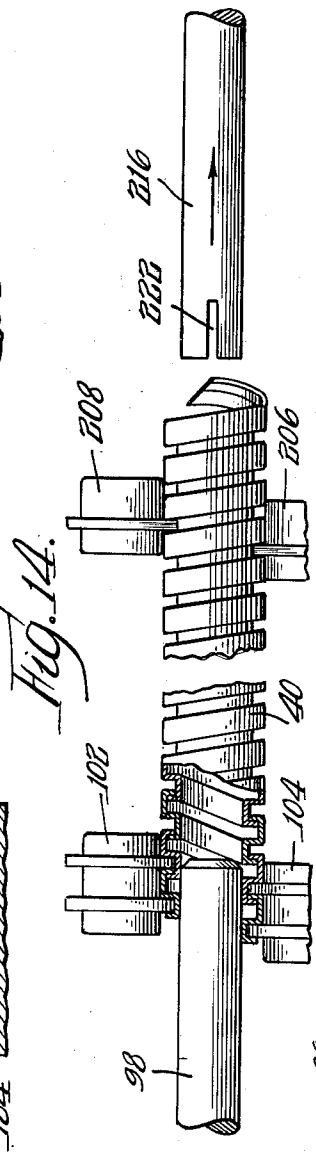


Fig. 14.

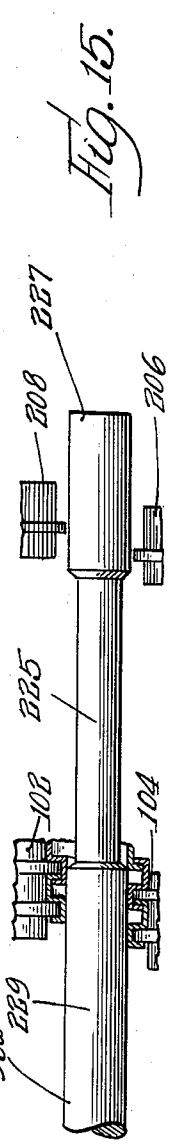


Fig. 15.

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2,595,747

UNITED STATES PATENT OFFICE

2,595,747

TUBEMAKING MACHINE

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Application May 16, 1947, Serial No. 748,635

6 Claims. (Cl. 113—35)

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This invention relates to tube making machines and methods, and concerns particularly machines for making tubing continuously from a helically coiled strip.

In the manufacture of tubing from helically coiled strip, various means have been proposed for effecting the coiling of the strip into helical form with the edges of the strip mechanically interlocked or otherwise joined together to form the tubing structure. The wrapping of the strip onto an elongated profiled arbor, if properly carried out, results in the production of a tubing of accurate and uniform size, but involves the difficulty that the machine must be periodically stopped and the completed tubing removed from the length of arbor onto which it has been formed. This removing operation is tedious and time consuming, and frequently difficulty is encountered in freeing the tubing convolutions from the profiling of the arbor, if a profiled arbor is employed.

The use of a relatively short arbor onto which the tubing strip is wound and from which it is continuously ejected permits the continuous formation of the tubing, but involves the difficulty that tubing of inaccurate and non-uniform size may be produced due to erratic feeding of the tubing strip, and like causes.

It is an object of the present invention to provide a tube making machine, of the type wherein the tubing is formed continuously from a helically coiled strip, of improved construction and improved operating characteristics.

More specifically stated, it is an object of the present invention to provide a tube making machine of the type defined incorporating improved forming and driving means for the tube strip, whereby to effect the more rapid and reliable formation of the tubing of an accurate, predetermined, and uniform size.

A further object of the invention is to provide for the manufacture of an improved quality of tubing, by the continuous operation method, and for the manufacture of certain types of interlocked tubing structures not heretofore producible by such method.

Another object of the invention is to provide in a machine of the type defined improved means and methods for effecting the starting of the tube strip into tubular form, in the operation of the machine.

A still further object of the invention is to provide an improved machine for effecting the continuous manufacture of tubing from helically coiled strip, which avoids the difficulties heretofore discussed.

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Various other objects, advantages and features of the invention will be apparent from the following specification when taken in connection with the accompanying drawings wherein certain preferred embodiments are set forth for purposes of illustration.

In the drawings, wherein like reference numerals refer to like parts throughout:

Fig. 1 is a side elevation, partly diagrammatic in form and with certain parts broken away for clarity, of a tube making machine constructed in accordance with and embodying the principles of the invention, in accordance with one preferred embodiment thereof;

Fig. 2 is an end view of the machine structure;

Fig. 3 is an enlarged partial plan section of the drive means for the main or winding head, taken as indicated by the line 3—3 of Fig. 1, certain casing parts being shown in elevation;

Fig. 4 is a transverse sectional view of the structures shown in Fig. 3, taken as indicated by the line 4—4 thereof;

Fig. 5 is a transverse sectional view through the machine on the line 5—5 of Fig. 1, more particularly showing the main or winding head, and associated parts;

Fig. 6 is a detail sectional view, on a further enlarged scale, taken as indicated by the line 6—6 of Fig. 5, and more particularly showing the mounting for the winding and driving rolls;

Fig. 7 is a detail sectional view of the structure of Fig. 6 on the line 7—7 thereof;

Fig. 8 is an illustrative view showing the cooperative relationship of the main winding head and the auxiliary driving head, in the operation of the machine;

Fig. 9 is a detail illustrative view of the running and starting arbors;

Fig. 10 is an enlarged transverse sectional view of the structure of Fig. 8 on the line 10—10 thereof;

Fig. 11 is a detail sectional view of the structure of Fig. 10, on the line 11—11 thereof;

Figs. 12, 13 and 14 are illustrative views showing successive operating positions of the parts in the operation of the machine; and

Fig. 15 is a view, on the scale of Fig. 14, but illustrating a modified form of arbor structure as may in certain instances be desired.

In the drawings the invention has been illustrated incorporated into a machine for manufacturing flexible tubing from helically coiled strip wherein the juxtaposed strip edges are connected by mechanical interlocking, the invention having particular applicability in certain of its aspects

to the production of tubing of this type. It is to be understood however that various features and aspects of the invention, as hereinafter set forth, may be adapted to the production of tubing from helically coiled strip, of various specific types and kinds.

Referring more particularly to the drawings, and first to the embodiment of the invention illustrated in Figs. 1–14, in Fig. 1 a tube making machine is illustrated, comprising in general a base 10, a main or winding head 12, a driving or auxiliary head 14, and a driven receptacle 16 for receiving the finished tubing.

The various mechanisms of the machine may all be driven from a common power source, preferably comprising an electric motor 18 arranged to drive a main drive shaft 20 by means of V belts or other suitable driving means as indicated at 22. A friction clutch is provided, as indicated at 24, this clutch being arranged for actuation selectively either by a hand lever 26 or a foot pedal 28. When the clutch is closed, power is transmitted from the main drive shaft 20 to an auxiliary drive shaft as indicated at 30.

The shaft 30 is connected to drive a variator or change speed mechanism 32 of any approved type, diagrammatically illustrated in Fig. 1 as a change speed gearing, this gearing in turn providing a drive means for a shaft 34 which is arranged by means of bevel gearing 36 to effect the driving of the finished tubing receptacle 16. This receptacle preferably comprises a cylinder or drum into which the finished flexible tubing 40 is delivered, and within which it is accumulated in suitably coiled arrangement.

Shaft 30 is also arranged by means of chain drive 42 to effect the actuation of an auxiliary drive shaft 44 one end of which effects the actuation of a change speed gearing, diagrammatically indicated at 46, and the other end of which is arranged to drive a change speed gearing as indicated at 48. The gearing 46 is provided with an output shaft 50 arranged to effect the actuation of a drive chain 52 which propels the mechanism of the auxiliary driving head 14. Similarly the gearing 48 is provided with an output shaft 54 arranged to propel a drive chain 56 connected to drive a part of the mechanism of the main winding head 12. Shaft 44 is further arranged by means of a chain drive 58 to effect the actuation of the shaft 60 connected to drive a change speed gearing 62. The output shaft 64 of this gearing is arranged to propel a drive chain 66 which also extends up to and forms a drive means for a part of the mechanism of the main winding head.

It will be seen that by reason of the connections provided, when the motor 18 is in operation and the clutch 24 closed, the finished tubing receptacle 16 and the mechanisms of the main and auxiliary head structures 12 and 14 will all be simultaneously propelled in predetermined speed relationship. Further, the speed ratios between the receptacle and the head mechanisms, and also between the head mechanisms relative to each other and to the receptacle 16, may be varied by adjustment of the several change speed gearing or variator devices 32, 46, 48 and 62. The control handle 26 and foot pedal 28 provide readily operable means for either hand or foot actuation of the clutch structure. The clutch structure, being of the friction type, may be either momentarily actuated so as to jog the several driven mechanisms intermittently through short distances of travel, as for example during the set up of the machine, or completely engaged to effect the positive and continuous driving of the various mechanisms during the tube winding operations, and after the machine has been properly set up and adjusted.

The machine further includes a profiling mechanism generally indicated by the numeral 68, Fig. 2. The profiling mechanism is supported by a frame bracket 10a and comprises a series of pairs of profiling rollers 70, 72, 74 and 76, the roller pairs being progressively shaped so as to impart a profiled contour to the tube strip 78 as the strip is propelled through the profiling mechanism. The profiling rollers are geared together within the associated casing 80 by suitable gearing connections, these connections being driven by a drive shaft 82 which projects downwardly from the casing 80. Shaft 82 is connected to and driven from a change speed gearing mechanism 84 which mechanism is driven by means of a shaft 86 projecting outwardly from the main frame 10. As shown in Fig. 1, shaft 86 is driven from the drive shaft 44, in synchronized relation, by means of gearing connections 88. It will thus be seen that the profiling rollers will also be driven in synchronized relation with the other operating parts of the machine, whenever the clutch structure 24 is closed, and at a speed determined by the adjustable setting of the variator mechanism or change speed gearing 84.

The main winding head 12 comprises a housing 90, Fig. 1, for the various head driving mechanisms, and a support pedestal 92 carrying the various operating mechanisms of the head structure. Similarly the auxiliary head 14 comprises a casing 94 forming a housing for the head driving mechanism, and a support pedestal 96 carrying the various operating mechanisms of the auxiliary head.

The operating mechanisms of the main head structure are best shown in Figs. 5, 6, 8 and 10. These operating mechanisms comprise a rotatable arbor or mandrel 98 journalled in the support pedestal 92, and a series of winding rolls 100, 102 and 104 disposed in circumferentially spaced relationship around the mandrel, and cooperable therewith in the formation of the tubing, there being three such rolls provided in the particular embodiment of the invention disclosed. In the formation of the tubing, the tubing strip 78 is drawn from a supply roll 106, Fig. 2, and passes through the profiling mechanism and guide tube 107, being thus suitably profiled, as previously described. The strip then passes onto and is wound around the arbor 98, the strip being wound onto the arbor and held in engagement therewith to be thereby shaped into tubing form, by the winding rollers 100, 102 and 104. As the winding rollers engage the profiled strip, the juxtaposed strip edges are formed into mechanically interlocked engagement, as is characteristic of machines of the type described, and as will be understood.

The winding rollers 100, 102 and 104 are carried respectively by brackets 108, 110 and 112 bolted to a face plate 114, which face plate is in turn mounted on the face of the pedestal 92 by studs 116. The face plate is provided with slots as indicated at 118 so as to provide a limited rotatable adjustment of the face plate upon the loosening of the studs.

Each of the brackets 108, 110 and 112 adjustably supports its associated drive roll in a similar manner, and a specific description of one of the support brackets will suffice for all. By reference to Fig. 6, wherein the bracket 110 is specifically shown, it will be seen that the bracket car-

ries a sleeve 120 rotatably adjustable within the bracket and adapted to be clamped in adjusted position by means of a split skirt conical lock nut 122 threadedly secured into a conical recess in the bracket. By loosening the lock nut 122 the sleeve 120 may be rotatably adjusted to any desired position, by means of its upstanding projection 123.

The inner bore of the sleeve 120 threadedly receives a radially extending support bolt 124, the arrangement thus providing for the radial adjustment of the bolt relative to the support bracket by relative rotation between the bolt and sleeve. A lock nut 126 when tightened provides a holding means preventing inadvertent rotation of the bolt.

The lower end of the bolt carries a bracket 128 held in place by a lock nut 130, the bracket being provided with ways adjustably supporting the roll carrying yoke 132. Lock screws are provided as indicated at 134, Figs. 5 and 6, for holding the yoke in adjusted position relative to the slideway of the bracket 128. The yoke member carries an axle 136 upon which is fixed the winding roll by any suitable means such as set screw 138.

It will be seen that by reason of the connections provided each of the winding rolls may be circumferentially adjusted relative to the arbor by reason of the slots 118, radially adjusted by relative rotation of the support bolt, rotatably adjusted about its radial support axis by rotation of sleeve 120, and longitudinally adjusted parallel to the pivot axis of the roll by the shifting of the roll yoke member within its support bracket 128; whereby to adjustably position the rolls in respect to the tubing strip. These several adjustments permit the rolls to be adjusted for proper engagement with the strip, so as to effect their desired functions. These adjustments, coupled with the substitution of mandrels of different size, also enable the operation of the machine on tubing of different sizes, in accordance with the requirements of the particular work to be performed.

In accordance with the present invention, the winding rolls 100, 102 and 104 are rotatably propelled to effect the driving as well as the winding of the tube strip; and the roll driving means is so constituted and arranged as to remain operative and effective in all adjusted positions of the rolls as hereinbefore set forth. Referring to Figs. 3 and 4, it will be seen that the drive chain 66 engages a sprocket 140 which is secured to and drives a sleeve 142 the inner end of which is formed as a gear 144. Three pinions 146, 148 and 150 are journalled in the housing 90 in circumferentially spaced relation, in geared engagement with the drive gear 144. The pinions are secured to and arranged to drive, respectively, the shafts 152, 154 and 156 upon which they are mounted. These shafts are connected, respectively, to a series of three angularly disposed drive shafts 158 by means of universal connections 160, Figs. 3 and 8. The opposite ends of the shafts 158 are also provided with universal connections as indicated at 162 by which means the angular drive shafts are connected, respectively, to the axle pins of the winding rollers, such for example as the pin 136, Fig. 6. Each angular drive shaft is connected with its associated universal 160 by means of a splined connection of suitable form, illustrated in Fig. 3 as comprising a longitudinal groove 164 in the shaft cooperable with a key 166 carried by the universal member. It will be seen that by reason of the connections thus provided, operation of the drive chain 66 effects the corresponding rotatable driving of the three winding rolls 100, 102 and 104, in synchronized relation; while at the same time permitting the several positional adjustments of the winding rolls due to the universal and splined connections of the angular drive shafts.

It may also be desirable to effect the powered driving of the forming arbor 98, to further facilitate the driving of the strip and the action of the driven winding rolls; and such driving means is illustrated in the machine disclosed. Referring particularly to Fig. 3, it will be seen that the drive chain 56 engages a sprocket 168 secured to a stub shaft 170 by suitable means such as set screw 172. The stub shaft has fixed on its end a collar 174 arranged to have splined connection with a drive shaft 176, the arrangement thus being such that the stub shaft 170 and the drive shaft 176 rotate as a unit, but the latter is permitted of a predetermined range of reciprocatory motion.

As best shown in Figs. 8, 9 and 12, the drive shaft 176 has its collared end 178 fixed to the inner end of the arbor shaft 98 by means of set screw 180, the arbor shaft and drive shaft 178 thus comprising an integral unit. A compression spring 182 normally holds the parts in the position shown in Fig. 13, during the running of the machine, so as to hold an adjustable collar 184 on the arbor into engagement with a bushing 186 fitted into the support pedestal 92. It will be seen that by the loosening of set screw 180, and the substitution of the bushing 186 and the arbor 98, arbor and bushing assemblies of various required sizes may be employed in accordance with the sizes of tubing to be formed. In Figs. 8 and 12 the arbor is shown in a leftward or starting position, compressing the spring 182, for a purpose presently to be described.

It will be seen that by reason of the connections provided, in all positions of the arbor and at all times the arbor will be rotatably driven in accordance with the movements of the drive chain 56.

In the event that it is desired to provide means for forcibly ejecting the tubing strip longitudinally of the arbor, to insure its removal therefrom, the bushing 186 may be provided with an extension projecting to the right as seen in Fig. 12, longitudinally of the arbor, and provided with a strip engaging helical end face, as will be understood.

The auxiliary driving head 14 is functionally and structurally similar to the winding head 12 except for the omission of the forming arbor and the parts connected therewith. More particularly, the auxiliary driving head is provided with three rolls 190, 192 and 194, Fig. 2, carried by brackets 196, 198 and 200 in the same manner as the winding rolls 100, 102 and 104 are carried by their support brackets 108, 110 and 112; the same mounting means and adjustments being provided.

The drive rolls 190, 192 and 194 are arranged to be driven, respectively, by three angularly disposed drive shafts 202, Fig. 8, universally and spline connected as in the case of the drive shafts 158 previously described. The angular drive shafts are connected with and driven from three planet pinions 204, 206 and 208, Figs. 2 and 8, in geared driving relation with a sun gear 210 formed as a part of a sleeve 212, the end of which comprises a sprocket 214 interconnected with and driven by the drive chain 52. By reason of the connections provided, as the drive chain 52 is operated, the three drive rolls 190, 192 and 194

are driven in synchronized relation therewith; the drive rolls being also arranged for the various adjustments heretofore described while preserving the power drive relationships.

The auxiliary driving head structure is hollow so that the finished tubing may be projected therethrough, as shown in Fig. 1; and also for the reception of a starting arbor used in the set up of the machine to initiate the tube forming operation. The starting arbor is best shown in Figs. 8 and 9, and in the illustrative views, Figs. 12–14. The starting arbor comprises a smaller cylindrical portion **216** of a size corresponding to the tubing to be formed, and a larger splined portion **218**. This latter splined portion is arranged to fit the correspondingly shaped inner splined bore of a sleeve member **220**, Fig. 8, formed as a part of and rotatable with the rotatably driven sleeve **212**. The arrangement is such that the starting arbor, when inserted into the sleeve **220**, is constrained for rotation therewith while being free for longitudinal sliding movement. The starting arbor is further provided with a slit or recess **222** in the end of its reduced cylindrical portion, for a purpose presently to be described.

To initiate the tube forming operation, the starting arbor is inserted into the sleeve **220** and manually forced against the running arbor **98** so as to project the latter to the left against the compression of spring **182**, and into the position shown in Figs. 8 and 12. In this position of the parts it will be seen that the end of the starting arbor is disposed substantially coplanar with the plane of operation of the winding rolls. The end of the tube strip is inserted into the starting arbor slot **222** so as to be gripped thereby, and the clutch **24** then manipulated to initiate the tube winding movement. As the winding progresses, the arbors will be automatically propelled to the right, into the position shown in Fig. 13, both arbors being simultaneously rotatably powered by the means heretofore described. Continued operation causes the tube end and the starting arbor to be propelled to the right, until the tube becomes gripped between the powered drive rollers **190**, **192** and **194**, becoming propelled thereby. After the tube has become gripped between the auxiliary drive rolls the starting arbor may be withdrawn from the tube end, as shown in Fig. 14, the tube end following, during continued operation, through the auxiliary head sleeve **220**, and the curved guide tube **224**, Fig. 1, into the drum receptacle **16**.

In the operation of the machine, the conjoint action of the powered drive rollers **190**, **192** and **194**, and the powered drive and winding rollers **100**, **102** and **104**, and in combination with the associated drive mechanisms and structures provided, effects the movement of the tubing strip through the machine, continuously and at a uniform drive rate. The two sets of driven rollers, both of which form a part of the tube forming mechanism, facilitate and insure the proper movement of the tube strip through the machine. More particularly, the winding and drive rollers **100**, **102** and **104** both bend and drive the strip, whereas the rolls **190**, **192** and **194** by reason of their further engagement with and driving of the strip properly form and size the strip convolutions as they move around the mandrel and are shaped into tubular form. Accurate and uniform sized tubing is provided, and a tight mechanical interlock between the juxtaposed strip edges may be effected, if desired, without destroying the uniformity or predictability of the product, even under conditions of high speed operation. The several speed variator mechanisms **62**, **48** and **46** permit the driving of the arbor **98**, the winding rolls **100**, **102**, **104**, and the auxiliary drive rolls **190**, **192** and **194** at slightly different peripheral speeds in accordance with the requirements of a particular tubing being formed. In this connection the auxiliary drive rolls are preferably driven at a slightly higher peripheral speed that the tube forming parts, causing the auxiliary drive rolls to impart a sizing and slight polishing action to the tube. The machine of the present invention is usable in connection with the manufacture of tubing of various sizes, and is particularly adapted for the manufacture of small size tubing which in many instances cannot be properly formed on conventional machines. The improved starting arrangements facilitate the set up of the machine, irrespective of tubing size.

In Fig. 15 a modified form of running arbor is disclosed, as may in certain instances be desired. In this instance it will be seen that the arbor, indicated by the reference numeral **98***a*, is provided with an extension of reduced size, as indicated at **225**, extending beyond the working portion of the arbor which cooperates with the forming rolls. The end of the extension **225** terminates in a larger cylindrical portion **227** of a size preferably a few thousandths of an inch smaller than the main body or working portion **229** of the arbor. The extended working portion **227** thus provided cooperates with the auxiliary drive rolls, facilitating the action thereof and providing a further guide means for the tubing as it is projected from the forming station.

It is obvious that various changes may be made in the specific embodiments set forth for purposes of illustration without departing from the spirit of the invention. The invention is accordingly not to be limited to the specific embodiments shown and described, but only as indicated in the following claims.

The invention is hereby claimed as follows:

1. A tube making machine comprising a base frame, a tube forming arbor mounted on said frame, means for feeding an elongated tube strip onto said arbor, means for driving said arbor, tube forming mechanism for coiling the strip helically around the arbor with the juxtaposed strip edges secured together in tubing form, said mechanism including at least two sets of rolls mounted on said frame in predetermined spaced relation axially of the tubing and engageable with the outer periphery of the strip in its tubular form, a supporting member for each set of rolls and mounted on said frame, a supporting pintle member for each roll, bracket means carrying each supporting pintle member and mounted on said supporting member, a shiftable member carried by the bracket means and engageable with each pintle member and shiftable to effect rotation thereof about its longitudinal axis for adjusting the angular disposition of the roll supported thereby, means supported by said bracket means adjacent and cooperating with said pintle member to effect movement thereof along its longitudinal axis for adjusting the radial disposition of the roll carried thereby relative to the tubing, and power means for rotatably driving the rolls of both sets at a predetermined peripheral rate of speed thereby to effect the forming and power propulsion of the strip into tubular form.

2. A tube making machine comprising a base frame, a tube forming arbor mounted on said

frame, means for feeding an elongated tube strip onto said arbor, means for driving said arbor, tube forming mechanism for coiling the strip helically around the arbor with the juxtaposed strip edges secured together in tubing form, said mechanism including at least two sets of rolls mounted on said frame in predetermined spaced relation axially of the tubing and engageable with the outer periphery of the strip in its tubular form, a supporting member for each set of rolls and mounted on said frame, a supporting pintle member for each roll, bracket means carrying each supporting pintle member and mounted on said supporting member, shiftable means carried by the bracket means in engagement with said pintle member and shiftable relative thereto to effect rotation of the pintle about its longitudinal axis for adjusting the angular disposition of the roll supported thereby, means cooperating between said shiftable means and said pintle to effect movement of said pintle along its longitudinal axis for adjusting the radial disposition of the roll carried thereby relative to the tubing, and power means for rotatably driving the rolls of both sets at a predetermined peripheral rate of speed thereby to effect the forming and power propulsion of the strip into tubular form.

3. A tube making machine as claimed in claim 2, wherein a supporting plate carries the bracket means of each set and wherein means are provided for connecting said plate to said supporting member for circumferential shifting thereof relative to the tubing axis whereby to adjust the rolls circumferentially of the tubing axis.

4. A tube making machine as claimed in claim 2, wherein each pintle member carries a roll supporting member connected to a corresponding pintle for sliding movement thereon in a direction axially of the tubing for adjusting each roll axially of the tubing.

5. A tube making machine comprising a base frame, a tube forming arbor mounted on said frame, means for feeding an elongated tube strip onto said arbor, means for driving said arbor, tube forming mechanism for coiling the strip helically around the arbor with the juxtaposed strip edges secured together in tubing form, said mechanism including at least two sets of rolls mounted on said frame in predetermined spaced relation axially of the tubing and engageable with the outer periphery of the strip in its tubular form, a supporting member for each set of rolls and mounted on said frame, a threaded supporting pintle for each roll, bracket means for supporting each pintle and mounted on said supporting member, a sleeve member internally threaded to threadedly engage said pintle and rotatably supported in said bracket means, said pintle being rotatable within said sleeve member to effect shifting of the pintle axially thereof for adjusting the roll carried thereby radially of the tubing and said sleeve member being rotatable in said bracket means to bodily rotate the pintle for adjusting the angular disposition of a roll carried thereby relative to the tubing axis, and power means for rotatably driving the rolls of both sets at a predetermined peripheral rate of speed thereby to effect the forming and power propulsion of the strip into tubular form.

6. A tube making machine comprising a base frame, a tube forming arbor mounted on said frame for limited longitudinal shifting movement during rotation thereof, means for feeding an elongated strip onto said forming arbor, tube forming and driving mechanism for coiling the strip helically around the forming arbor with the juxtaposed edges thereof secured together in tubing form and including a set of forming rolls and a set of driving rolls with each set of rolls mounted on said frame in predetermined spaced relation coaxially of the tubing and engageable with the outer periphery of the strip in tubular form, a removable starting arbor initially traversing the space between said sets of rolls in alignment and juxtaposition with said forming arbor, means mounting said rolls for adjustment relative to the tubing axis, power means for effecting positive rotation of said rolls and said arbors in predetermined speed relation, drive connections between said power means and said forming arbor and said starting arbor for positively rotating the arbors while permitting axial shifting thereof, both said arbors being initially shiftable in unison in the direction of the forming rolls to position the end of the starting arbor at least partially within the operative surfaces of the said forming rolls, and spring means interposed in the drive connection between said forming arbor and said power means and interconnecting a fixed abutment surface and the forming arbor for shifting the forming arbor and with it the starting arbor in the direction of the driving rolls to remove the starting arbor from within the forming rolls after initial formation of the tubing by said forming rolls.

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