July 17, 1934. P. WITTE 1,966,877

COLLAPSIBLE TUBE FORMING AND THREADING MACHINE

Filed Nov. 7, 1933 3 Sheets-Sheet 1

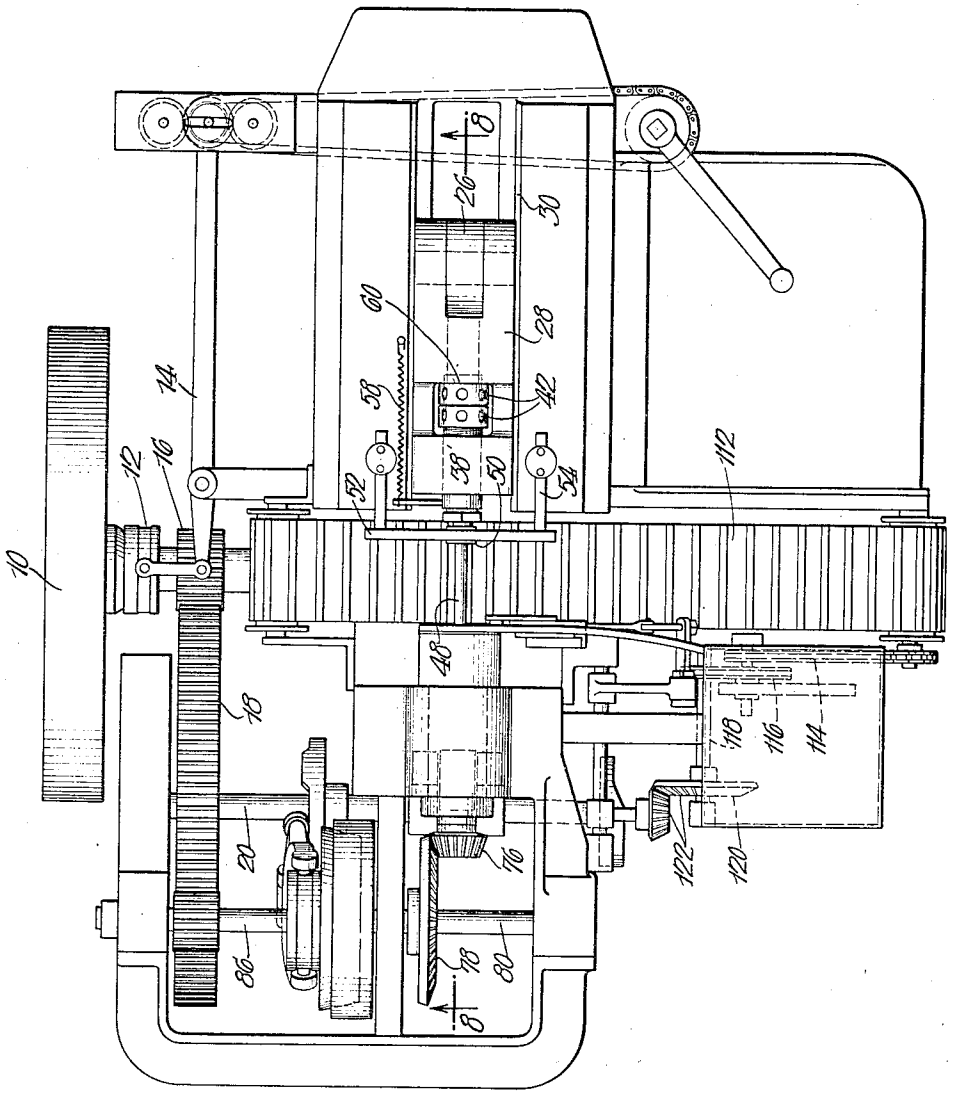


Fig. 1.

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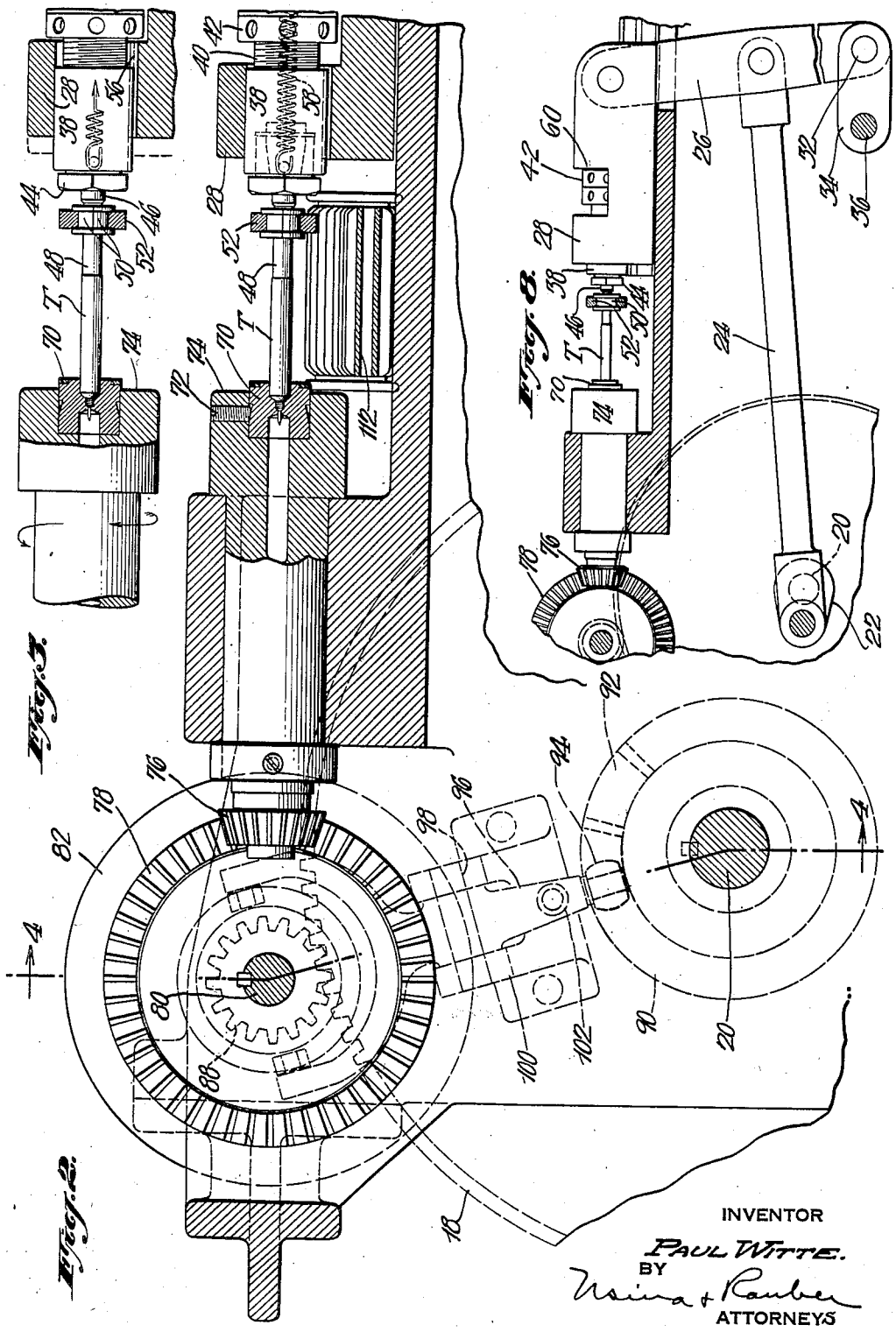


Fig. 2.

Fig. 3.

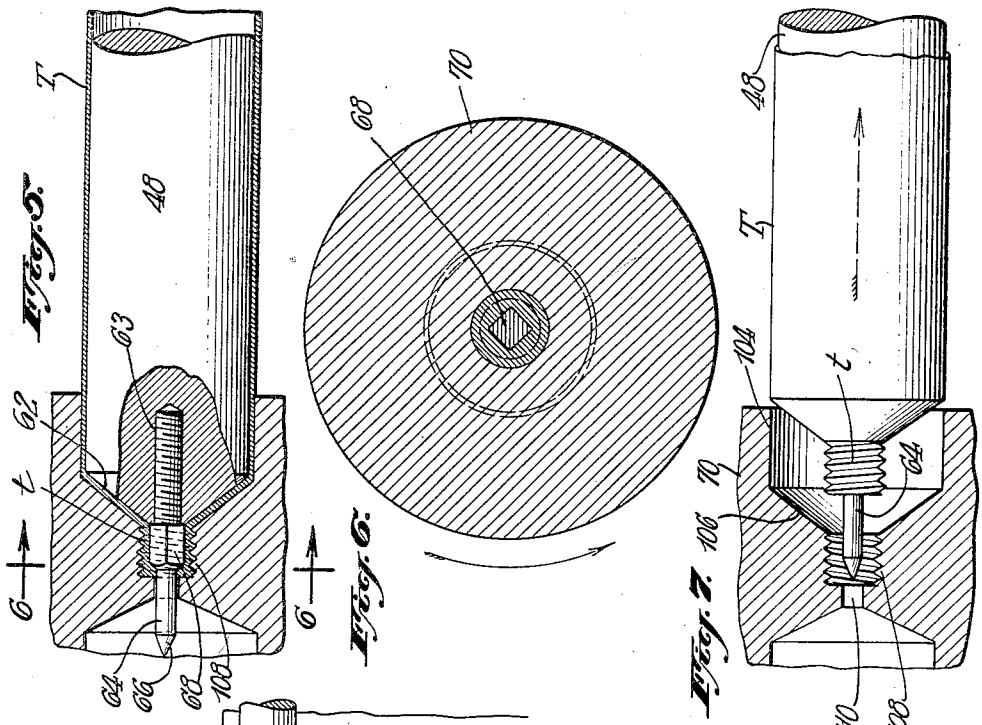
Fig. 8.

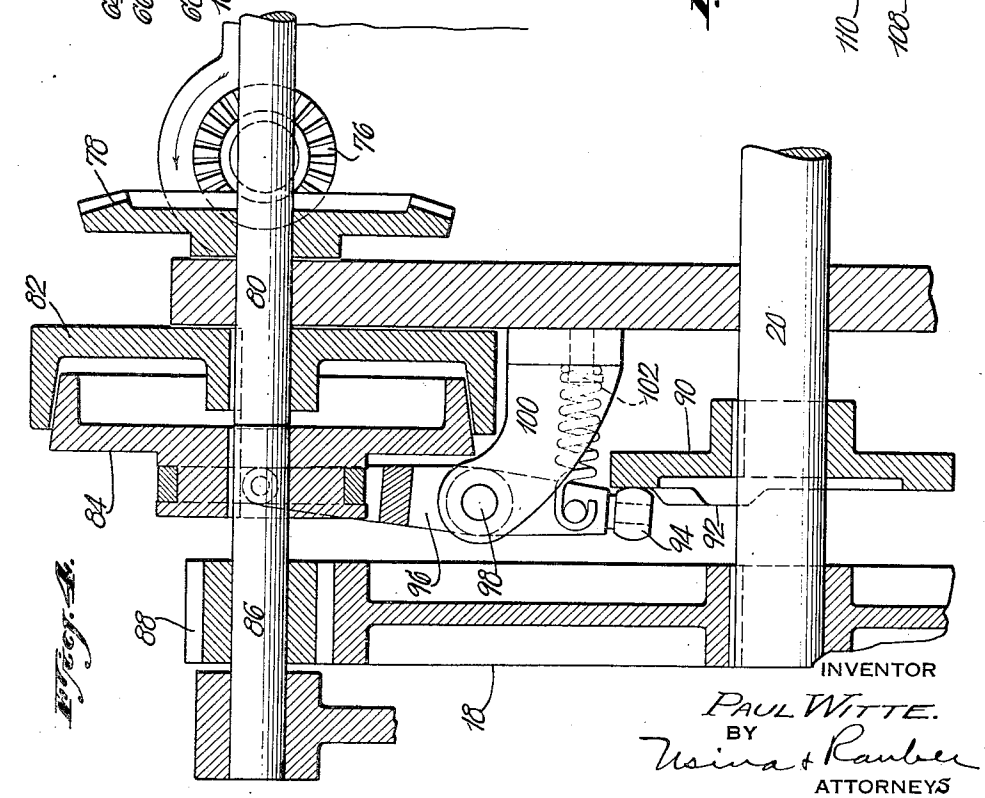
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Patented July 17, 1934 1,966,877

UNITED STATES PATENT OFFICE

1,966,877

COLLAPSIBLE TUBE FORMING AND THREADING MACHINE

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Application November 7, 1933, Serial No. 697,006

14 Claims. (Cl. 207—9)

This invention relates to improvements in machines for making collapsible tubes of the character used for dispensing tooth paste, shaving cream and similar plastic materials.

Heretofore, collapsible tubes have been made by machines involving the use of coacting die and plunger, the die being adapted to receive a disc-like blank or slug of ductile metal such as block tin, lead, or the like and a plunger usually coacts with the die. When the plunger strikes the disc or slug carried in the die, the metal is extruded around the plunger, thus forming the tube. Tubes so formed have heretofore been stripped from the plunger in various ways and then transferred to other machines equipped with means for performing certain trimming and threading operations on the tube so as to condition the same for receiving a screw threaded closure cap.

My invention aims to provide important improvements in machines for forming collapsible tubes and a particular feature relates to the provision of means whereby a thread is formed on the outlet neck of the tube simultaneously with the formation of the tube by extrusion. At the same time, an outlet opening is formed in the threaded neck. In this way, I effect important economies in the production of tubes, it being apparent that by the utilization of my invention tubes need not be separately handled to produce the threads on the neck thereof. The invention also effects an important saving in the cost of special machine equipment heretofore required for the threading of the necks of the tubes. The above and other more detailed features of the invention will be fully apparent from the following specification when read in connection with the accompanying drawings, in which—

Fig. 1 is a plan view of a tube forming and threading machine embodying my invention; Fig. 2 is an enlarged vertical longitudinal section through the forming and threading die also showing related parts; Fig. 3 is a fragmentary view of parts shown in Fig. 2, but illustrating relative movement of certain parts; Fig. 4 is a vertical transverse section on the staggered line 4—4 of Fig. 2; Fig. 5 is an enlarged fragmentary longitudinal section taken through the die and showing a portion of the plunger cooperating therewith, the view also showing a threaded section of a tube formed about the plunger; Fig. 6 is a section on line 6—6 of Fig. 5; Fig. 7 is a view illustrating the relative position of the die and plunger after the die has unscrewed itself from the threaded neck of the tube formed about the plunger; Fig. 8 is a skeleton section taken on line 8—8 of Fig. 1 illustrating the means for reciprocating the carriage which carries the tube forming plunger.

Referring in detail to the drawings, 10 represents a main drive pulley by means of which power is transmitted to clutch 12 controlled by suitable clutch mechanism 14 for driving pinion 16 which in turn transmits power through gear 18 to shaft 20 having a crank 22 connected by a pitman 24, Fig. 8, with a lever 26 adapted to reciprocate the carriage 28 in slidable and suitable guides 30. The lever 26 is fulcrumed at 32 on a link 34 pivotally supported at 36, the arrangement being such that the crank 22 through the connections described transmits a straight line motion to the slidable carriage 28.

Mounted for limited longitudinal movement relatively to the carriage 28, there is a punch holder 38 having a threaded shank 40 adjustably supporting threaded collars 42. At its forward end, the holder 38 carries a chuck 44 in which is removably secured a shank 46 of a male die member or plunger 48 about which the collapsible tubes are adapted to be formed. A suitable split stripper collar 50 surrounds the plunger 48 and is supported by a bridge piece 52 carried by supports 54 suitably secured to the base of the machine.

The holder 38 for the plunger is mounted with freedom for slight endwise play relatively to the carriage, but is prevented from turning by a key or spline connection 56. A spring 58 normally tends to pull back the holder 38. The rearward movement of the holder 38 relatively to the carriage is of course limited by the rear collar 42 striking the face 60 of the carriage.

The plunger 48 at its forward extremity is tapered, as indicated at 62, to conform to the desired shape of the foreward end of the tube to be formed thereon. Secured by left hand threads 63 in the extremity of the plunger, there is a piercing punch 64, the extreme end 66 of which is in the form of an acute point so as to readily pass through the metal of the slug or blank, as will more fully hereinafter appear. The punch 64 carries a noncircular enlargement 68 which is adapted to prevent the tube formed about the plunger from turning as the female die member is being rotated to disengage itself from the formed tube as will hereinafter appear.

The female die member, which coacts with the punch 48, is indicated as a whole at 70 and is detachably secured by means of a set screw 72 to

an intermittently rotatable mandrel 74 which carries a beveled pinion 76 meshing with a gear 78 secured on a shaft 80. This shaft has keyed or otherwise secured thereto a clutch member 82 adapted to coact with a clutch cone 84 slidable on a shaft 86 which is axially aligned with said shaft 80. The shaft 86 carries a pinion 88 which meshes with and is driven by the previously mentioned gear 18 carried by the shaft 20. The shaft 20 carries a crowned cam 90 having a raised portion 92 adapted to coact with the roller 94 secured to a clutch operating fork 96 pivoted at 98 to bracket 100 in order to cause the clutch cone 84 to engage the clutch member 82 and thus intermittently rotate the mandrel 74, which carries the die member 70. A spring 102 normally tends to maintain the clutch cone 84 disengaged from the clutch member 82.

The die member 70, as best shown in Figs. 5 and 7, is provided with a cavity 104 of a diameter slightly greater than the diameter of the plunger 48, the forward end of this recess is tapered, as indicated at 106, to correspond with the frustoconical end of the tube to be formed by coaction of the plunger with the die.

Internal right hand screw threads 108 are formed in the die, as indicated, and an opening 110 is provided to permit the free passage therethrough of the piercing punch 64. The threads 108 formed in the die are so designed and arranged that when the plunger 48 and punch 64 move forwardly into contact with a slug or blank previously inserted in the recess 104 of the female die member that continued forward movement of the punch will by extrusion cause the metal of the slug or blank to flow, while in a cold state, so as to form the tube about the punch substantially as illustrated in Fig. 5 and at the same time to form the threads *t* on the neck of the tube T. After the tube has been thus formed, as indicated in Fig. 5, the raised portion 92 of the cam 90 will rock the clutch fork 96 and through the clutch and gearing 76 and 78 above described cause the mandrel 74 and die 70 to rotate a sufficient number of turns to unscrew the die from the threaded end of the tube, thus bringing the parts substantially to the position illustrated in Fig. 7. During this unscrewing operation, the non-circular enlargement 68 formed on the punch 64 will effectively prevent the tube T from turning relatively to the punch 48. During the unscrewing operation, it will be appreciated that the punch 48 and its carrier 38 will move in a longitudinal direction relatively to the carriage 28 and during this movement the spring 58 will assist in properly retracting the punch and the formed tube carried thereby from the die. The amount of relative play between the plunger carrier 38 and the carriage 28 can be adjusted to a nicety by turning the threaded collars 42 on the threaded shank 40 of the plunger carrier 38.

After the completed tube has been unscrewed from the die 70, continued rearward movement of the plunger 48 will bring the rear edge of the tube into engagement with the stripper members 50 and further rearward movement of the plunger will of course strip the completed threaded tube from the plunger and deposit it on a suitable traveling conveyor 112. This conveyor travels immediately below the path of movement of the punch and, therefore, the completed tubes fall a minimum distance after their formation. The conveyor is driven through the sprocket chains 114, 116, shaft 118 and a gear 120 and a beveled gear 122 carried on the extreme end of the shaft 20 above referred to.

The slugs from which the tubes are formed are fed and positioned within the cavity of the die member 70 by any suitable slug or blank feeding means and the same is not further described as it forms no particular part of the present invention. A suitable means for feeding such slugs is described in my prior Patent No. 1,886,459 of November 8, 1932.

From the foregoing, it is apparent that my machine provides means whereby a disc-like blank or slug of metal can at a single operation be formed into a collapsible tube having a discharge neck with threads on its exterior adapted to receive a threaded closure cap. The machine thus accomplishes a single operation, a result which heretofore required a plurality of operations and a plurality of separate machines.

While I have described quite specifically details of the embodiment of the invention herein illustrated, it is not to be construed that I am limited thereto as the invention is thought to be broadly new and various modifications may be made by those skilled in the art without departure from the invention as defined in the appended claims.

What I claim is:—

1. A machine for making tubular articles comprising a die with a screw threaded recess portion, said die being arranged to receive a slug from which the article is to be formed, a plunger cooperating with the die and about which the articles are formed, means for effecting a relative longitudinal movement between the plunger and the die and means for effecting a relative rotary movement between the plunger and the die so as to release the threaded engagement between the article formed on the plunger and the die.

2. A machine for making tubular articles comprising a plunger on which the articles are formed, a slug receiving recessed die coacting with the plunger and having a threaded portion into which part of the slug is adapted to be extruded, means effecting a relative movement between the plunger of the die in the direction of the longitudinal axis of the two said parts and intermittently operating means for unscrewing the die from the article formed on the plunger.

3. A machine for making tubular articles comprising a plunger about which the articles are formed, a die coacting with the plunger and having a slug receiving recessed portion formed with internal screw threads, means rotatably supporting said die, means for intermittently rotating said die, and means for reciprocating the plunger toward and from said die.

4. A machine for making tubular articles comprising a rotatably mounted die having a recessed slug receiving portion formed with internal screw threads, a plunger coacting therewith about which the articles are formed, means for effecting a relative longitudinal movement between the die and plunger, and means operable in timed relation to the relative movement of the plunger and die for effecting a relative rotary movement to disengage the threaded tube formed on said plunger from the threads of the die.

5. A machine for making tubular articles comprising a rotatably mounted die having a slug receiving recess with internal screw threads formed therein, means for intermittently rotating said die, a plunger, a carriage for reciprocating said plunger, and supporting means for the

plunger mounted in said carriage with freedom for limited longitudinal movement.

6. A machine for making tubular articles comprising a rotatably mounted die having a slug receiving recess with internal screw threads formed therein, means for intermittently rotating said die, a plunger coacting with said die, a carriage for reciprocating said plunger, supporting means for the plunger mounted in said carriage with freedom for limited longitudinal movement relatively thereto and means for adjustably limiting the relative movement between such supporting means and said carriage.

7. A machine for making tubular articles comprising a rotatably mounted die having a recess with internal screw threads formed therein, means for intermittently rotating said die, a plunger coacting with said die, a carriage for reciprocating said plunger, supporting means for the plunger mounted in said carriage with freedom for limited longitudinal movement and means for adjustably limiting the movement between such supporting means and said carriage, and yielding means for moving said supporting means relatively to said carriage.

8. A machine for making tubular screw threaded articles comprising a rotatably mounted die having a slug receiving recess with internal screw threads formed therein, a plunger coacting with said die, a carriage, means for supporting the plunger with freedom for limited slidable movement relatively to the carriage, mechanism for reciprocating said carriage, a member for turning said die, a driving element common to said mechanism and said member, and means operating in predetermined timed relationship to the movements of said plunger for automatically making and breaking the driving connection between said driving element and said member.

9. A machine for making tubular screw threaded articles comprising a rotatably mounted die having a slug receiving recess with internal screw threads formed therein, a plunger coacting with said die, a carriage, means for supporting the plunger with freedom for limited slidable movement relatively to the carriage, mechanism for reciprocating said carriage, a member for turning said die, a driving element common to said mechanism and said member, a clutch controlling the transmission of motion to said die turning member and means moved by said driving element for actuating said clutch.

10. A machine for making tubular screw threaded articles comprising a one piece solid die having a threaded portion forming a mould-like recess, a plunger coacting with said die and about which the tubular articles are formed, means for moving the plunger toward and from the die and means for releasing the die from its threaded engagement with the tube formed about the plunger.

11. A machine for making tubular screw threaded articles comprising a one piece solid die having a threaded portion forming a mould-like recess, a plunger coacting with said die, means moving the plunger toward and from the die, a punch secured to said plunger and an enlargement on said punch effective to force the metal of the tubular article into conformity with the threaded portion of the die and means for unscrewing the die from its threaded engagement with the tube formed about the plunger.

12. A machine for making tubular screw threaded articles comprising a solid die having a threaded portion forming a mould-like recess, a plunger coacting with said die about which the tubular articles are formed, means carried by the plunger for preventing the article formed thereon from turning and means for intermittently rotating the die to unscrew it from the article formed on the plunger.

13. A machine for making tubular screw threaded articles comprising a die having a threaded portion forming a mould-like recess, a plunger coacting with said die about which the tubular articles are formed, means carried by the plunger for preventing the article formed thereon from turning, and means for reciprocating said plunger, means for rotating said die, a common driving element for said die rotating means and said plunger reciprocating means and means for automatically making and breaking the driving connection between said driving element and said die rotating means.

14. A machine for making tubular articles comprising a reciprocating carriage, a plunger slidably mounted thereon, means limiting the movement of the plunger relatively to the carriage, a slug receiving die having an internally screw threaded recess formed therein, a piercing punch on said plunger, means for preventing rotation of the article formed on the plunger, means synchronized with the movements of said carriage for intermittently rotating said die to release it from the article formed about said plunger.

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