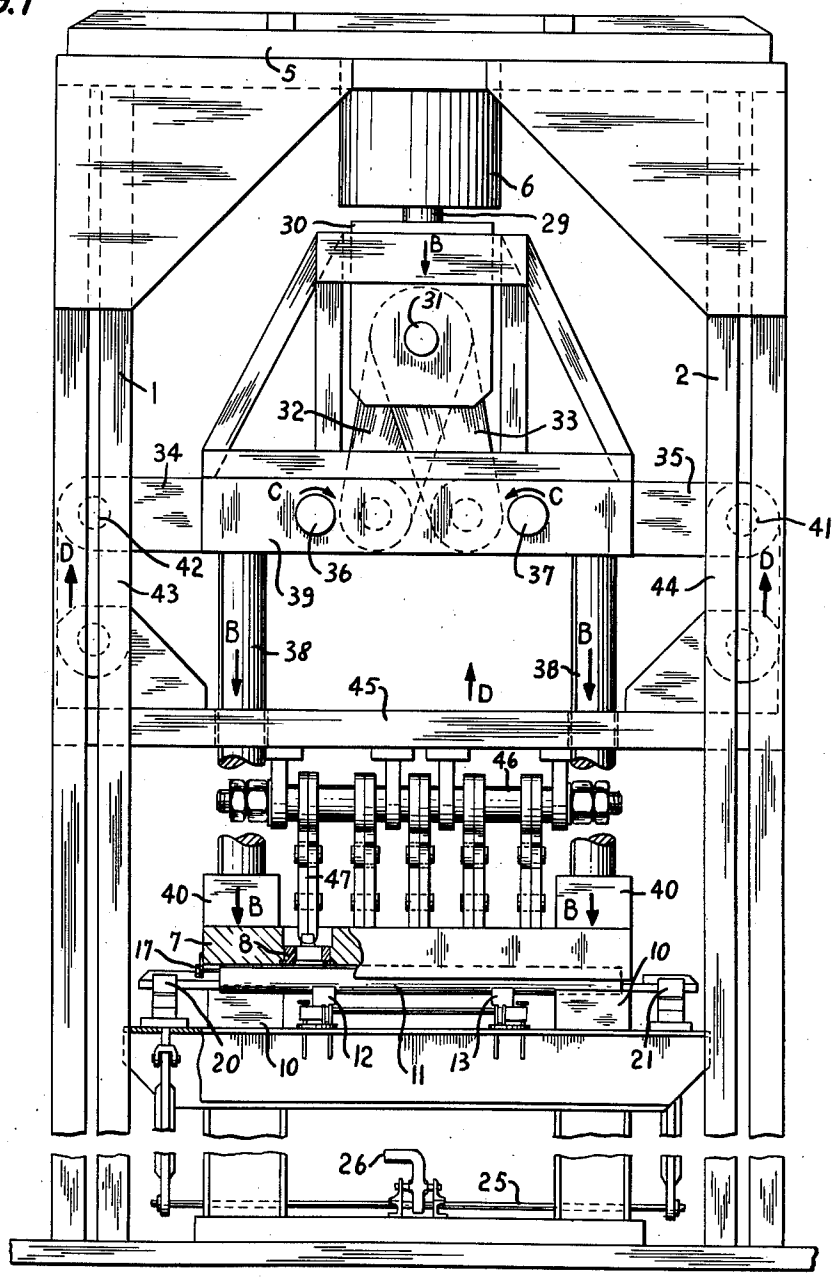
April 24, 1962 A. HUET 3,031,005

MACHINE FOR MANUFACTURING COUPLING-COLLARS

Filed April 11, 1960 4 Sheets-Sheet 1

FIG. 1



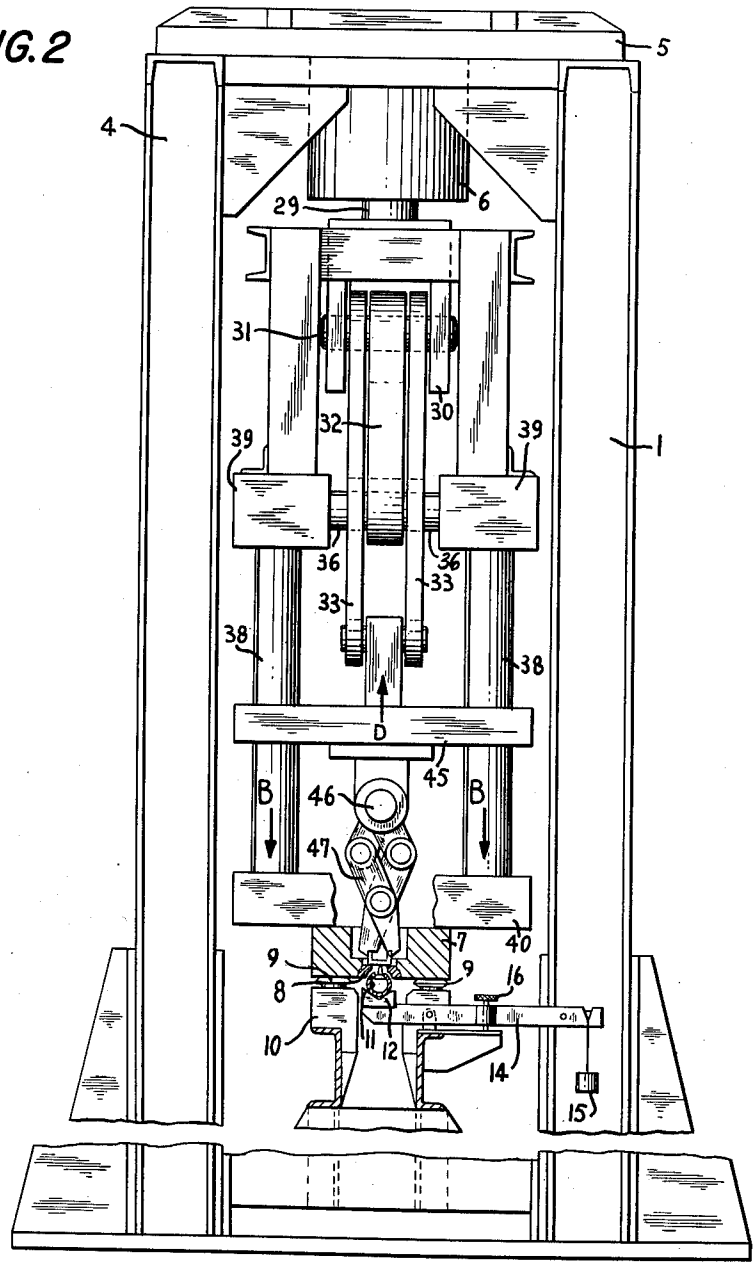
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MACHINE FOR MANUFACTURING COUPLING-COLLARS

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FIG. 2



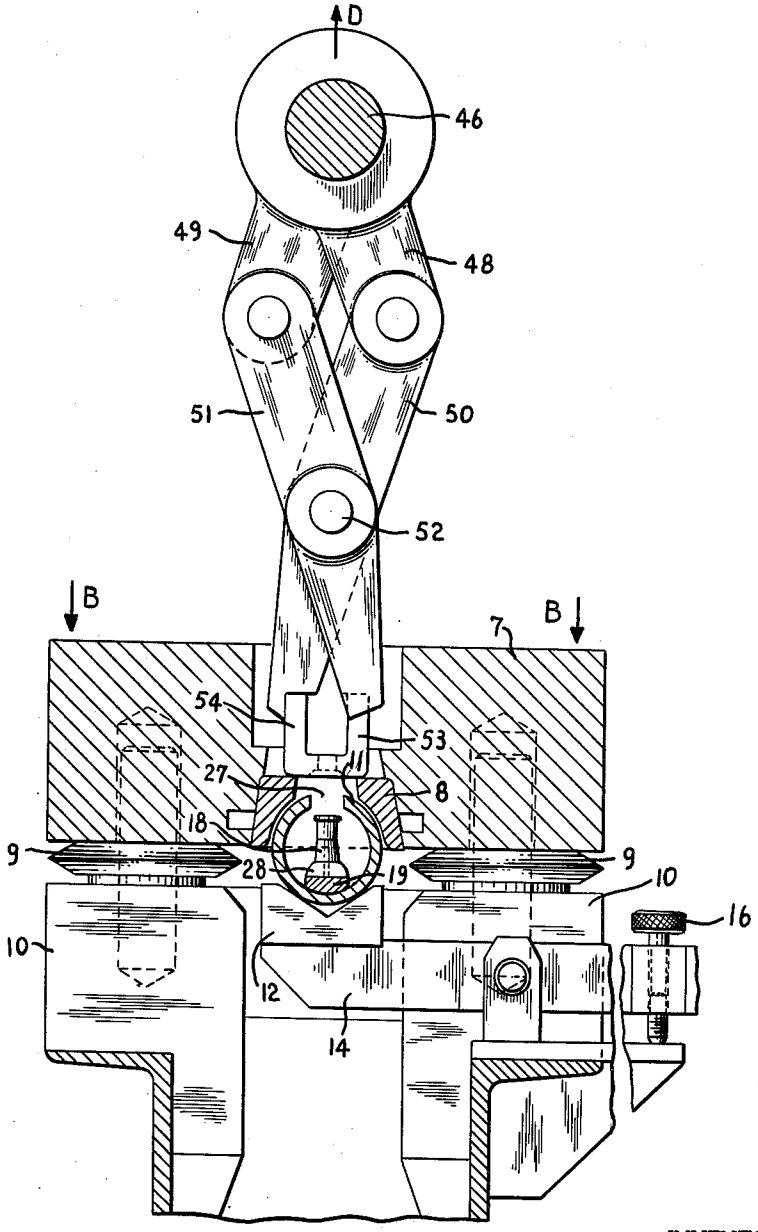
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FIG. 3



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FIG. 4

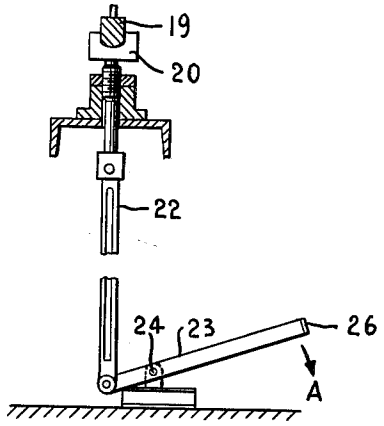


FIG. 5

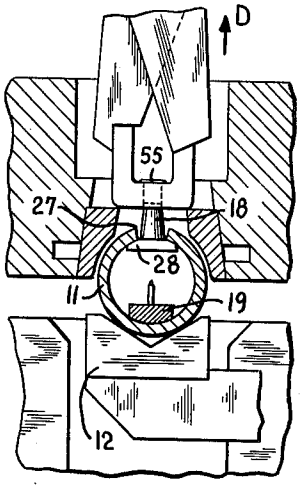
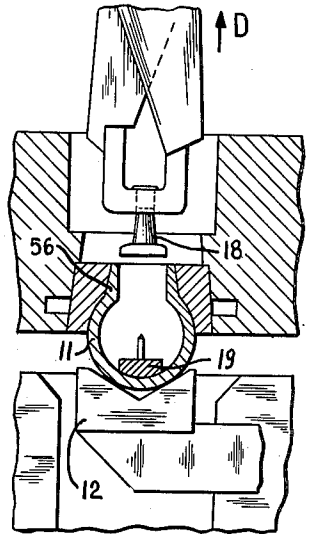


FIG. 6



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MACHINE FOR MANUFACTURING COUPLING-COLLARS

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Claims priority, application France Apr. 13, 1959
4 Claims. (Cl. 153—21)

It is known to manufacture tubular collars, that is to say, tube-couplings on collectors, by means of a punch which passes through the wall of the main collector and lifts up the wall so as to form the coupling-collar, in combination with a die applied externally on the collector. The upward movement of the punch is effected either under the action of a jack placed in the interior of the collector or under the action of a supporting bar or of a lever which is displaced in the interior of the collector.

In addition, it is also known to manufacture coupling-collars, which are generally formed on tubes having a small diameter, by forming an orifice in the wall of the collector and by extracting, through said orifice, a core placed in the interior of the collector, so that the movement of extraction raises the edges of the orifice and thereby forms the tube coupling-collar.

The present invention has for its object a machine intended to manufacture a tube coupling-collar, or simultaneously a series of coupling-collars, in alignment or otherwise, along a generator line of a collector. The machine comprises a punch, or one or a number of rows of movable punches which are arranged in the interior of the collector, this latter being placed in position in the machine, while a device serves to draw said punches upwards in such manner that the head of each punch passes through an orifice previously formed in said wall. The machine is so designed that the following operations which form the coupling-collar or collars are subsequently carried out in combination.

(1) A die, or a series of dies, corresponding to the coupling-collars which it is desired to produce, is applied against the external face of the collector, or alternatively the collector is applied against the die or dies.

(2) In the interior of each die, an extractor device or pincers, is provided and adapted to grip the head of the punch which has passed through the wall of the collector. The operation of engagement of the head of the punch between the pincers can take place prior to the downward movement of the dies, and at the time when the head of the punch has passed into the orifice of the collector.

(3) The extractor device is drawn upwards while being supported on the die, so that the punch passes through the wall and forms the coupling-collar which is developed in the die, by means of which it is given its shape and thickness. Both the action and the reaction balance each other during the operation, between the resistance to extraction and the application of the die on the collector.

This synchronization of movements of the positioning of the die and the extraction of the punches produces the following advantages:

(1) The operation is carried out very rapidly and during the operation, there is consequently no substantial cooling of the collector which is previously heated, all the more so as the die only touches the hot collector-conduit while the work is in progress, thereby requiring a minimum effort to produce the coupling-collars by extraction.

(2) The optimum temperature of the heated collector is maintained during the progress of the operation, since this latter is effected very rapidly and there is no modification of the structure of the metal.

(3) It follows from the above advantages that, when it is required to manufacture a coupling-collar and in particular a series of coupling-collars in a collector-conduit having thin walls, satisfactory coupling-collars are thus obtained without tearing of the metal.

(4) The work-parts or tools, namely the punches and dies, have the benefit of being kept in better condition, since they come into contact with the collector when this latter is at high temperature, only for the strict minimum length of time necessary for the formation of the tube coupling-collars.

In a form of embodiment of the machine which will be described below, the operations mentioned above can be carried out by means of a single jack, hydraulic or the like, with or without step-down gearing. The piston-rod of the jack acts by means of a system of levers, in such manner as to apply the die to the collector (or vice versa) and to initiate the lifting of the extractor device which is brought into engagement with the head of the punch.

In the case in which the single jack employed to effect the three movements is of the hydraulic type, it is preferable to provide a system of effort-multiplication of the mechanical advantage between the rod of the jack and the members to be moved, so that a relatively small travel of the jack produces a longer travel of the extractors, thereby increasing as a result the speed of extraction.

The description which follows below, reference being made to the accompanying drawings which are given by way of example only, without any limitation being implied, will make it quite clear how the invention may be carried into effect.

FIG. 1 illustrates a view in elevation of the machine forming the object of the invention, the lower portion of said view being partially broken away.

FIG. 2 is a view in profile and in partial cross-section, of FIG. 1.

FIG. 3 is an illustration in transverse cross-section, on a larger scale, of the collector in position in the machine, with an extractor device, and prior to the operation of manufacture of the coupling-collar.

FIG. 4 illustrates diagrammatically and on a larger scale one side of the device for lifting the punches in the interior of the collector, prior to the extraction of the coupling-collar.

FIGS. 5 and 6 are detail views, in which the positions of the extractor and of the punch with respect to the collector, shown respectively before and after the formation of the coupling-collar, are illustrated in cross-section to the same scale as FIG. 3.

The frame of the machine is composed of vertical uprights 1, 2, 3, 4 assembled together at their upper portion and at their lower portion by means of angle-irons and cross-members. The body of the hydraulic or other jack 6 is mounted on an upper cross-member 5. The die-carrier bar or plate 7 is placed in the vicinity of the bottom portion, while as many dies 8 as there are coupling-collars to be formed simultaneously on the collector-conduit are removably mounted on said die-carrying bar or plate 7.

Five extractors have been illustrated in the drawing. There are consequently five dies 8 in the die-holder 7 in order to manufacture five coupling-collars simultaneously. There could be either less or more.

The die-holder 7 rests on Belleville washers 9 (FIGS. 2, 3) a few millimeters above a lower girder 10 which is rigidly fixed to the frame.

The collector 11, in which orifices have preferably been pierced at the locations where it is desired to form coupling-collars is heated to the required temperature and is introduced laterally underneath the die-holder 7.

This collector then rests in the vicinity of its extremities, on two troughs 12 and 13 (FIGS. 1, 2, 3). Each trough is mounted at the extremity of a lever 14 (FIGS. 2 and 3), which pivots on the frame and is provided at its other extremity with a counterpoise 15 which balances the weight of the collector. The lever is immobilized by means of an adjustment screw 16 (FIGS. 2 and 3) which comes into abutment against a plate fixed to the frame, so that the collector 11 is placed as can be seen in FIG. 3, a few millimeters from the internal face of the die 8, so as not to touch said die prior to the extraction operation and thereby avoids any loss of heat.

In its movement of insertion beneath the die-holder 7, the collector 11 is stopped by an abutment 17 (FIG. 1) provided by a screw which forms a stop-block against the edge of the collector, in such manner that each of the holes pierced in the collector, at the location in which it is desired to form the coupling-collar, is vertically above the axis of the corresponding die 8.

As many punches 18 as the number of coupling-collars which it is desired to manufacture are disposed in the interior of the collector. Each punch 18 is detachable and can be fitted on a small shaft which is rigidly fixed to a bar 19 which supports the punches (FIGS. 3, 4, 5, 6), and which extends under the entire length of the collector and rests on each side of this latter on stirrups 20 and 21 (FIG. 1 and FIG. 4). Each stirrup 20 (FIG. 4) is supported by a system of levers 22, 23, the lever 23 being pivotally mounted on the fixed point 24, and the extremities of the levers 23 being coupled together by a bar 25, in the center of which a pedal 26 is mounted as shown in FIGS. 1 and 4. By actuating the pedal 26, the lever 23 is caused to pivot in the direction of the arrow A (FIG. 4), thereby causing the stirrups 20 and 21 to move upwards, and the punch-carrier bar 19 thus lifts the punches from the position which they initially occupied as shown in FIG. 3, up to the position illustrated in FIG. 5, in which the upper portion 55 of the punch has passed through the orifice 27 pierced in the wall of the collector. As can be seen in FIG. 5, the whole of the lower and actively working base 28 of the punch then comes into position around and below the orifice 27 in readiness for effecting the operation of extraction of the coupling-collar. The head 55 of the punch has opened the jaws of the extractor, but these jaws as yet have no gripping action on said head.

The articulated system of levers intended to effect the extraction of the punches by means of the jack 6 will now be described below. In principle, this system acts like a corkscrew, so as to be applied on the one hand on the die-holder 7 and on the other hand so as to draw the extractors upwards as they grip the punches 18, just as a cork is extracted by using the edge of a bottleneck as a support.

The jack 6 carries a rod 29, at the extremity of which there is provided a forked member 30 (FIGS. 1 and 2), the two arms of which provide a passage for a shaft 31. Between the two arms of the fork and on the shaft 31 are pivotally mounted two connecting-rods 32 and 33. The double connecting-rod 33 encloses the connecting-rod 32 which is mounted inside 33 (FIGS. 1 and 2).

The connecting-rods 32, 33 are pivotally mounted on two levers 34, 35 (FIG. 1) which pivot around the shafts 36 and 37 designed to act as fixed points. The shafts 36, 37 are mounted in a gantry constituted by four uprights 38 joined together at the top by cross-members 39, and at the bottom by cross-members 40 at right angles and which are brought to bear on the die-holder 7 as can be seen in FIGS. 1 and 2). At the extremities 41 and 42 of the levers 34, 35 are pivotally mounted connecting-rods 43 and 44 (FIG. 1) which are also pivotally mounted on an extractor-carrying plate 45. This plate 45 is adapted to slide on the uprights 38 either from the bottom position to the top or from top to bottom (FIGS. 1 and 2), a shaft 46 being mounted below said plate and parallel to this latter shaft are fitted as many extractor devices 47 as the number of coupling-collars which it is desired to extract simultaneously.

A description of one of these extractor devices follows below, reference being made to FIG. 3. In this figure, it can be seen that a double connecting-rod 48 and a single connecting rod 49 located inside the double connecting-rod are fitted on the shaft 46. The connecting-rods 48 and 49 are thus able to pivot about the shaft 46. At the extremities of the connecting-rods 48, 49 are pivotally mounted the extremities of two levers: one lever 51 is double, while the other is a single lever 50, both being coupled together and pivotally mounted at a common point 52, while the jaws 53 and 54 which are intended to grip the head 55 of the punch 18 are mounted on the other extremities of said levers and are either screwed or fixed to these latter in a detachable manner.

When the punch 18 has been drawn upwards as described above with reference to FIG. 5, in such manner that the head 55 of said punch passes through the collector, the head 55 has separated the jaws 53 and 54 which are subsequently brought into engagement beneath the said head in the position illustrated in FIG. 5.

The extraction of the punch and the formation of the coupling-collar are carried out as follows:

When the pressure is applied to the jack 6, the rod 29 and the fork 30 move downwards in the direction of the arrow B (FIG. 1). During this movement, the gantry constituted by the four uprights 38 and the transverse girders 40 is brought to bear on the die-holder 7. At the same time, under the effect of the downward movement of the fork 30, the levers 34, 35 pivot around the shafts 36, 37 in the direction of the arrows C, thereby producing the upward movement of the extractor-carrying plate 45 in the direction of the arrows D. The shaft 46, around which the extractor devices are fitted, is drawn upwards in the direction of the arrow D (FIGS. 1, 5 and 6). The jaws 53, 54 grip the heads 55 of the punches and draw these latter upwards. The resistance then compels the shafts 36, 37 to apply the gantry 38 against the die-holder 7, thereby compressing the Belleville washers 9 and consequently applies the dies 8 against the collector 11 from which the said dies had hitherto been separated by a space of a few millimeters.

It can be seen that the action of extraction on the punches is equal to the reaction of the gantry on the dies and vice versa, in such manner that the collector is compressed and as it were suspended between the dies and the punches which move in opposite directions. This movement ensures the passage of the base 28 of the punch 18 through the wall of the collector 11, thereby forming the coupling-collar 56 as can be seen in FIG. 6.

After the formation of the coupling-collars and after cooling of these latter, the collector is detached from the dies and falls back into the troughs 12 and 13, from which it is extracted sideways or falls freely towards the base of the machine.

The arrangement of connecting-rods and articulated levers which transmits the movement of the jack to the extractor devices, by virtue of the fact that it is provided with levers 34 and 35 having arms of unequal length, serves to step down the action of the jack in such manner that the travel of the jack, of the order of 3 cms., for example, produces an upward travel of 12 cms. of the extractor devices 47. In this manner, the passage of the punch through the wall of the collector to form the coupling-collar, the distance of said passage being of the order of one centimeter, takes place four times as rapidly as the travel of the jack over the same distance.

Modifications could be made in the machine, without thereby departing from the scope of the present invention.

In particular, it is intended that the punches, which in the case of the machine described above, are drawn upwards by the supporting bar 19, could also be drawn upwards by means of a jack so as to pass through the

wall of the collector, in which orifices are not necessarily formed before placing the collector in position in the machine. It is also provided that the action of this latter jack could continue during the operation of extraction of the punch by means of the pincers, as in the case of the machine described above. The action of the two jacks would thus be combined, one jack being the jack 6 which has been described above while the other additional jack acts in the reverse direction so as to force back the punch through the wall and thus facilitate the formation of the coupling-collar.

What I claim is:

1. A machine for the manufacture of at least one coupling-collar on a collector by means of at least one movable punch placed inside the collector and withdrawn from said collector by means of a punch extraction device, the wall of the collector being supported by dies, said machine comprising a frame, supports for carrying the collector, said supports pivoting on said frame with means for balancing the weight of the collector, a support mounted on said frame with the interposition of elastic means and carrying the dies for supporting said collector wall, said elastic means initially holding said dies spaced apart from said collector, the punch extraction device being carried on said support and displacing said support at the moment of extraction, thereby bringing said dies into contact with the collector in opposition to said elastic means.

2. A machine for the manufacture of at least one coupling-collar on a collector by means of at least one movable punch placed inside the collector and withdrawn from said collector by a punch extraction device having set of articulated jaws actuated by a jack, the wall of the collector being supported by dies, said machine comprising a frame, supports carrying said collector, said supports pivoting on the frame with means for balancing the weight of the collector, a support mounted on the frame with the interposition of elastic washers and carrying the dies supporting said collector, said washers initially holding the dies spaced apart from said collector, the punch extraction device with articulated jaws being carried on the support for the dies and applying said dies against the collector in opposition to the action of the elastic washers, when the jack actuating said jaws is set in operation.

3. A machine for the manufacture of coupling-collars on a wall of a collector comprising a frame, a jack mounted in said frame supports pivoting on said frame and adapted to receive said collector with means for balancing the weight of said collector, a supporting rod extending longitudinally inside the collector, means for

lifting the said supporting rod, a set of movable punches inserted in the collector, on said supporting rod, at the emplacements of the coupling-collars to be produced, a die-holder resting on said frame through the intermediary of elastic washers, said die-holder supporting the dies which hold the wall of the collector around each coupling-collar during the formation of said collar and holding said dies initially spaced apart from the collector, a punch-extraction device constituted by articulated jaws actuated by said jack, said jaws being mounted on a support held on the die-holder, whereby the actuation of said jaws brings the dies into contact with said collector.

4. A machine for punch forming a coupling collar on a collector heated to a forging temperature, said collector having an orifice pierced at the site of the prospective collar and said machine having a punch with oppositely disposed ends, one said end being a large working base and the other a small head, said machine comprising; a frame; die holder means resiliently mounted in said frame; a die mounted in said die holder means and shaped to outline the form of the exterior of said collar and to fit the exterior of said collector adjacent said orifice; support means mounted in said frame for pivotally supporting at only two points said collector just clear of said die and with said orifice in alignment with said die and normal thereto; second support means mounted in said frame for supporting said punch in said collector with the small head end in alignment with said orifice, said support means including means for raising said punch to project the small end thereof through said orifice; jack means mounted in said frame and arranged for exerting pressure in the direction of said die holder means; connecting means operatively connecting said jack means to said die holder means and to the projecting head of said punch, said connecting means arranged to apply pressure from said jack means to said punch equally and oppositely to the jack pressure applied to said resiliently mounted die holder means for bringing the die mounted therein into contact with the collector as the punch is drawn through said orifice in the collector to form said coupling collar whereby heat loss in the heated collector to the machine is kept at a minimum and the collar is formed quickly and easily.

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