MACHINE FOR FIXING SHOELACE HOOKS, EYELETS, AND THE LIKE IN WORKPIECES

Antonín Žítek, Zlín, Czechoslovakia, assignor to
Bata, národní podnik, Zlín, Czechoslovakia

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This invention relates to a machine for fixing shoelace hooks, eyelets and the like into two opposite parts of a work-piece, for example into both uppers of a piece of footwear. For brevity such a machine is herein referred to as a double-acting hook-inserting machine.

The attaching of the shoe lace hooks to the uppers of pieces of footwear has been carried out hitherto predominantly by single acting machines, by means of which the shoe lace hooks are inserted into the individual sides of the uppers one after the other, and are then riveted.

Although this manner of operation is lengthy it is still preferred to that of double-acting hook-inserting machines as hitherto known because the latter are not yet sufficiently developed and therefore, show various shortcomings. Thus, the known double-acting hook-inserting machines usually operate without a hole punching device, so that the hole required for the insertion of a hook has to be punched out of the work-piece by the hook shaft itself. In this manner only a thin work-piece material could be punched through, and the punching was not always perfect, which caused either stoppages of operation or defective fixing and/or riveting of the shafts of the hooks in the material. For fixing bigger hooks in a stronger material the punching-out of the hole by the shaft of the hook itself is entirely unsuitable; one has therefore tried also to punch the required holes out of the work-piece on a different machine, and then to use the inserting machine only for the inserting and riveting of the hooks. In this case, however, difficulties resulted concerning the accuracy of adjustment of both sides of the upper within the working range of the machine in which the hooks were to be inserted into the pre-perforated holes, so that even this procedure did not give satisfaction. Moreover, the designs of the double-acting hook-inserting machines as hitherto known are very complicated and, consequently, such machines are expensive.

The present invention provides a double-acting hook-inserting machine which, while being of the utmost simplicity of construction, admits a continuous working operation comprising firstly forming an appropriate aperture by means of a piercing punch and then, on the same spot, inserting and riveting a hook in the said aperture.

The machine is characterised by a working tongs, both jaws of which are equipped each with a piercing punch for the pre-perforation and with a riveting punch for the subsequent inserting and riveting of the hooks, the piercing on the one hand and the riveting on the other hand being effected at will simultaneously on both sides of the work-piece.

Conveniently, the arrangement is such that the working tools disposed on the jaws of the tongs are alternatively shifted into the operative position, i.e. transversely across the direction of feed of the work-piece. The working tools cooperate in this process advantageously with counter-matrices which may be arranged on a slide which is also movable transversely across the direction of feed of the work-piece simultaneously with the tongs.

 Provision is or may be made for the feed of the work-piece to be effected by an automatic feeder device whereas hitherto a lateral movement of the piercing or riveting tool head itself was generally used for that purpose.

By way of example one form of a double-acting hook-inserting machine according to the invention is shown on the accompanying drawings, whereon—

Fig. 1 is a front elevation of the machine;
Fig. 2 is a side elevation of the machine;
Fig. 3 is a perspective view of the driving mechanism and working devices of the machine;
and
Figs. 4 to 11 show the positions of individual components of the machine in various working phases.

In the illustrated machine the drive is effected from a power source M, arranged in the machine casing 1, via a belt drive acting on a belt pulley 2 which is keyed to a clutch shaft 3 and which carries a hand wheel 5. On the left end (Fig. 3) of the shaft 3 there is the driving part 4 of a clutch the driven part of which is designed as a double cone 8 fixed to a shaft 8 which is capable of being shifted longitudinally and is adapted to be coupled alternatively with the said driving part 4 or with a brake disc 7 arranged on a bracket 6. Between the bracket 6 and the double cone 8 there is a return spring 14 which urges the double cone, and thereby the whole shaft 8, towards the right away from the bracket. A ring 11 serves for shifting the shaft 8, this ring being arranged on the shaft and engaged by a forked lever 12 rotatable about a fixed pivot 13. The free end of the fork is equipped with a follower roller 15 as shown in Fig. 11 in contact with a disc 16 which is rotatable with and freely shiftable axially on the main shaft 18 and carries a cam 17 on one side. On the other side of the disc is a two-armed starter lever 19 having a pawl 20 which is separate from the said disc and which can be partly turned and is shiftable axially on the shaft.
A chain 23 attached to one end of this lever leads to a pedal (not shown) whereas a tension spring 17 acts on the other end of the lever. The pawl 20 co-acts with a recess 21 in a stationary sleeve 22 which is fixedly attached to the machine casing and may form a bearing for the shaft 10. When the spring lever 10 is in the appropriate position, the main shaft 16 is driven from the gear wheel 10 of the clutch shaft 9 via a gear wheel 24 in a pre-determined way as will be hereinafter described.

On the main shaft 16 there are arranged cam discs 30, 33 and 46 for the operation of the individual working devices of the machine.

The most important working device is formed by a working tong 25 the pivot 26 of which is arranged on a forked arm 27 of a bell crank lever 27, 28 which performs a swivelling motion about a stationary pivot 29. The swivelling motion of the forked arm 27 is controlled by the other arm 28 which is operated through a follower roller 31 by the cam disc 30. The bell crank lever 27, 28 is under the bias of a spring load 32; its swivelling motion causes an up-and-down movement of the whole of the workpiece 25. The closing and opening movement of the arms of the tongs is effected by the cam disc 33 which presents two cams controlling the movements of said arms. Advantageously the said arms are extended by resiliently mounted levers 34, which are pivoted at 35 to the arms and the free ends of which are connected with one another by a tension spring 36 serving to hold them permanently in contact with the cam disc 33. The outer ends of the lever 34 are connected, by set screws 35 and compression spring 36, with the arms of the tongs 25. The screws 35 are screwed into the arms, pass freely through openings in the ends of the levers 34 and by their heads form adjustable abutments for the latter to limit the clearance between the levers and the arms of the tongs. Movement of the levers 34 within this clearance is opposed by the comparatively strong compression springs 37. The transmission of force to the tongs 25 when the upper ends of the levers 34 are forced apart by means of the cam disc 33 is suitably effected by means of the springs 37 which ensures a uniformity of the closing movement of the tongs; this is very important particularly in view of the unavoidable lack of uniformity and the varying thickness of the material of the work-piece.

In the lower end or jaws of the arms of the tongs the working tools proper are exchangeably and if desired adjustably arranged. These tools are a hollow hole-piercing punch 39 and a riveting punch 40 on each jaw. These working tools 35, 40 co-operate alternatively with corresponding counter-matrices 46, 47 arranged on a slide 41 which is moved up and down by means of the slide 41 which carries the abutment bolts 44. The slide is therefore forced by the spring 43 to take part in the up and down movement of the tongs. A recess 76 (Figs. 3 and 7) provided in the guide 42 receives the punch 35 when the tongs 25 close in the upper position 1. e. during the rise of the levers 34.

It would be possible to connect merely flexibly the end plate 80 with forked arm 27, so that the slide 41 would permanently move up and down with the said arm 27. But here another structure will be described in which a temporarily contacting abutment bolt 44 and a roller guidance 45 is used. In this structure the upper position of the slide 41 is independent of the upper position of the abutment 45. The first named position is fixed by a bolt 81, the inner end of which penetrates into a groove 82 in the slide 41. In this case the distance between the upper and lower position of the slide 41 can be advantageously much shorter than the distance between the end positions of the arm 27, which means a more simple construction, whereby, furthermore, the difference between the rotative movement 45 and the shifting movement of bolt 44 does not matter, provided the movement of abutment 45 away from guide 42 is sufficient to permit full upward movement of abutment 44.

The guide tongue 79 serves at the same time for the guiding of the work-piece, for example the upper A of a piece of footwear (Figs. 4 to D), the two parts of which are pushed over the tongue right up to guide ledges 46 (Fig. 5) arranged on the guide 42. Along these guide ledges the upper A is guided during the whole working operation in the position required for the maintenance of equal distance of the hooks to be inserted from the edge of the work-piece.

An automatic feeder device is driven by the cam disc 48 (Fig. 3) which is equipped with a guide track 50 and with a cam 51. The carrier body 52 of the feeder device swivels about a pivot 56 which is adjustable in a slotted guide 57. The pivot 56 is carried by the forked end 59 of a two-armed lever 55 which is rotatable about a stationary pivot 56 and is adjustable by hand; according to its adjustment (cam) and by means of a handle 61 the length of the feeder stroke is determined, and consequently the distance and/or the pitch of the shoe lace hooks to be inserted on both sides or upper of the work-piece. The upper part of the carrier body 52 forms a fork 53 with a pivot 59 which is guided in a guide slot 68 and carries on a protruding end a roller 67 engaging the guide track 59 of the cam disc 49. The curvature of the guide track 59 causes the swivelling movements of the feeder body 52 about the pivot 59, the amplitude of which oscillations can be changed by adjusting the pivot 56 in the guide slot 57.

The gripping means proper of the feeder device comprises a clamping tongs 53 the lower ends of the arms of which are equipped with small conical rollers 55 that may be knurled if desired. In the closed position, the tongs 53 is effected by means of a tension rod 66 guided in a projection 69 which rod carries at its lower end a lock head 70 with guide grooves 71 for the operating arms of the tongs and is equipped at its upper end with a roller 72 abutting against the cam disc 48. The rollers 54, 57, 64, 65, 67 and spring 73 which the rod 66 and its follower roller are kept permanently in contact with the cam disc. Attached to the spring abutment collar 74 on
the rod 68 is a tension chain 75 which can be pulled down by means of a pedal (not shown). Downward movement of the rod 68 either by means of the tension chain 75 or due to the roller 72 engaging the cam 51 of the cam disc 43, opens the jaws of the tongs 55; otherwise these jaws are kept closed by the force of the spring 73.

The main shaft 18 also drives a hook feeder device of any desired type. The hooks are fed from a supply hopper indicated at 65 through a rotary feed means 68 shown generally in Figs. 1 and 2. The force 22 means to the locus of operation for effecting the fastening thereof with respect to the workpieces.

The described machine allows of an advantageous arrangement of a mirror 73 (Fig. 2) in the neighbourhood of the working range of the tongs whereby convenient observation of the working procedure can be had even on the side of the work-piece averted from the operator.

The method of operating the machine is as follows:

The operator presses first the pedal (not shown) operating the tension chain 75, and thereby opens the jaws of the clamping tongs 53 of the feeder device. Between the opened jaws he puts both sides of the upper A (Figs. 4 to 9) which are pushed over the guide tongue 79 right up to the ledge 49 of the guide body 42 (Figs. 5 and 9) in such a manner that the guide tongue 79 lies between the two sides of the upper A. Next the said pedal is released whereupon the work-piece is clamped between the small rollers 55 of the tongs 55 under the bias of the spring 73.

Prior to starting the machine the working tongs 25 is in the position shown in Figs. 3 and 5, i.e. the jaws of the working tongs are opened and are in such a position that the piercing punches 38 come to lie over the working spot which in Fig. 5 is defined by the axis B-B, and the slide 41 carrying the hole-matrix 45 is oppositely the said punches in the appropriate position.

After the uppers A have been clamped by the rollers 55, the drive 83 is started in motion by depressing the pedal that operates the tension chain 23 (Fig. 3) whereupon the starter lever 19 is turned about the shaft 18 against the tension of spring 77 far enough for the pawl 20 to come opposite the recess 21 of the stationary bearing sleeve 22. Under the action of the spring 14 through the forked lever 12 pivoting about the fixed pivot 13, the pawl 20 then drops into the recess 21, the components 8, 9, 13 and 11 performing at the same time a shifting movement towards the right hand side so that the double cone 8 engages the driving part 9 of the clutch and is consequently set into rotation.

Through the toothed gearing 10, 24 the main shaft 18 of the machine is thus rotated. On Fig. 3 the distance of the double cone 8 from the clutch part 4 is exaggerated for the reason of a better understanding, but in reality this distance can be considerably smaller.

Rotation of the main shaft 18 causes first the two cams of the cam disc 32 to force the operating arms 34 of the working tongs 25 apart, whereby the jaws of the tongs are closed and apertures are punched out of the work-piece from both sides by means of the piercing punches 39. The punched-out pieces of material enter the bores of the piercing punches from where they drop out in the further course of the process at the opposite ends of the piercing punches.

After the punching out of the apertures in the work-piece the jaws of the working tongs 25 are opened again and at the same time the tongs are shifted upwards (Fig. 3) until the riveting punches 48 come to lie over the working position B-B (Fig. 7). The shifting of the tongs 25 is effected by the action of the cam disc 30 on the lever arm 28, which is tilted in the direction of the arrow 81 (Fig. 3) whereby the forked arm 21 swings the pivot 25 of the tongs in the direction S1. In this way the pivot 27 of the arm 21 the slide 41 too is shifted upward at the same time under the action of the spring 43. Accordingly, the riveting punches 40 as well as the counter-matrix 41 of the slide 41 arrive in the working position B-B (Fig. 7).

During this upward movement of the working tongs 25 hooks H (Fig. 6) are fed to the punched-out apertures in the work-piece by means of a hook feeder device. These hooks reach the working position engaged for example on a supporting plate C (Figs. 6 and 7) which forms a component of the hook feeder device.

At the moment when the hooks to be riveted, and likewise the riveting punches 40 and the riveting matrices 47 have assumed the working position the jaws of the tongs 25 are closed again under the action of the cams of the cam disc 33, whereby the hooks are inserted into the punched-out apertures in the work-piece by the action of the riveting punch 49 and the shafts of the hooks are riveted or burred over on the riveting matrix 41. It is clear that by this construction the riveting punches 40 and the hooks are brought and held by the supporting plates C.

During this riveting process the cam 51 of the cam disc 43 comes to bear against the follower roller 72 and presses the rod 66 down whereby the jaws of the clamping tongs 53 are opened and the rollers 55 release the work-piece. While the tongs 53 are held open by the cam 51 the carrier body 52 of the feeder device is tilted about the pivot 58 in the direction of the arrow 53 under the action of the guide track 56 of the cam disc 43, and after reaching the right hand end position, the cam 51 leaves the follower roller 72 whereby the jaws of the tongs 53 are closed again under the action of the spring 73 and the work-piece is again gripped by means of the rollers 55 (Fig. 6). Thus, while the hooks were being upset, the clamping tongs 53 was shifted from the position shown in Figs. 1 and 4 into the position shown in Fig. 6, that is, from a position remote from the jaws 25 to a position closer to them.

While the clamping rollers 55 are thus being shifted, the riveting of the hook shafts is finished and the hooks are thus firmly secured in the uppers. The jaws of the working tongs 25 are then again opened by means of the cam disc 33 and the spring 38 and the said tongs returned into the original position shown in Fig. 5. The pivot 26 is also moved back by means of spring 32 attached to the arm 29, and at the same time the slide 41 is moved to its initial position. When the tongs 25 are opened the work-piece which is clamped between the rollers of the clamping tongs 53 is pulled one feed step corresponding to the pitch of the hooks under the action of the guide track 50 of the cam disc 43 (opposite to the direction of the arrow 81 or Fig. 2) so that the work-piece A too comes into a new working position (Fig. 8).
Fig. 8 shows a sequence of the movements of the clamping rollers 55 of the feeder device. From the original position marked I the rollers 55 pass (in an open condition) during the riveting process via the position II into the position III in which the rollers 55 again grip the work-piece, and return via the position IV (in a clamped position and together with the work-piece) into the original position I.

If in a work-piece several hooks are to be fastened in a row one after the other without interruption of operation, the operator holds the pedal controlling the starter lever 18 in a depressed condition whereby the working process as described is repeated until the operator releases the pedal again. In this case the pawl 20, shown more clearly in Fig. 11, remains in the recess 21 and the disc 16 rotates with the shaft 18 and shifts forward and backward on the same in the free space between the follower roller 15 and the left hand side of the pawl 20, whereby the said roller 15 and the other elements connected thereto remain in their right hand position, whereby the clutch 4—8 is engaged and the clutch shaft 9 rotates.

Releasing the pedal after one or more revolutions of the shaft 18 causes an automatic turning-back of the starter lever 19 under the action of the spring 71, and a shifting-out of the pawl 20 from the recess 21 to the left side, thereby pushing the cam disc 16 towards the left (Fig. 3).

Prior to the completion of a working revolution of the main shaft 16 once it has been initiated, the cam 17 of the disc 16 arrives in front of the follower roller 15 of the forked lever 12 and, because disc 16 is now held by pawl 20 from movement to the right, shifts, by means of the ring 11, the clutch shaft 9 together with the double cone 8 also to the left whereby the latter is first disengaged from the clutch disc 4 and is then pressed against the brake disc 7 against which consequently any further rotation of the machine is braked off, since until cam 17 comes around to force roller 15 to the left, disc 16 will merely rotate in space between roller 15 and pawl 20.

It is clear that if the operator desires that but only one revolution of the shaft 18 should be made, he must hold the respective pedal in depressed position only until the clutch 8, 9 is engaged.

The operator can take off the finished work-piece from the machine after opening the jaws of the clamping tongs 53, and insert a new work-piece.

The working tongs 25 (arranged transversely across the direction of feed of the work-piece), the ends of which carry the tools 39, 40, are bent laterally as shown in Figs. 1 and 3 to enable, in conjunction with the above mentioned arrangement of a back mirror 78, unhampered observation of the working process.

I claim:

1. In a double-acting hook-inserting machine, especially for footwear, the combination of a working tongs having a pair of jaws, movable about a common and movable pivot point, a perforating punch and a riveting punch carried fast by each of the jaws of the tongs, said punches cooperating with counter-matrices, whereby each of the operations of perforating a work-piece and of riveting hooks in the perforations can be performed on two work-pieces simultaneously, and mechanism for intermittently feeding the work-piece between the jaws of the tongs, opening and closing the said jaws and shifting the tongs transversely to the direction of feed of the work-piece.

2. In a double-acting hook-inserting machine, especially for footwear, the combination of a working tongs having a pair of jaws, movable about a common and movable pivot point, a perforating punch and a riveting punch carried fast by each of the jaws of the tongs, said punches cooperating with counter-matrices, whereby each of the operations of perforating a work-piece and of riveting hooks in the perforations can be performed on two work-pieces simultaneously, and mechanism for intermittently feeding the work-piece between the jaws of the tongs, opening and closing the said jaws and shifting the tongs transversely to the direction of feed of the work-piece.

3. A machine as set forth in claim 1, including a bell crank lever mounted for swivelling motion about a stationary pivot, and means pivoting the tongs on said lever, whereby the common pivotal point of the tongs is arranged on an arm of the said bell crank lever.

4. A machine as set forth in claim 1, including a bell crank lever mounted for swivelling motion about a stationary pivot, and means pivoting the tongs on said lever, whereby the common pivotal point of the tongs is arranged on an arm of the said bell crank lever.

5. A machine as set forth in claim 3, including a cam disc for controlling the opening and closing of the jaws of the tongs.

6. A machine as set forth in claim 1, said mechanism including a cam disc for controlling the opening and closing of the jaws of the tongs.

7. A machine as set forth in claim 2, said mechanism including a cam disc for controlling the opening and closing of the jaws of the tongs.

8. A machine as set forth in claim 3, said mechanism including a cam disc for controlling the opening and closing of the jaws of the tongs.

9. A machine as set forth in claim 1, including two two-armed resiliently mounted levers forming extensions of the tongs, each lever being pivoted to the back end of the tongs and the back ends of the levers being connected one with another by a tension spring, and a cam disc rotatable between said levers to control the opening and closing movements of the jaws of the tongs.

10. A machine as set forth in claim 2, including two two-armed resiliently mounted levers forming extensions of the tongs, each lever being pivoted to the back end of the tongs and the back ends of the levers being connected one with another by a tension spring, and a cam disc rotatable between said levers to control the opening and closing movements of the jaws of the tongs.

11. A machine as set forth in claim 3, including two two-armed resiliently mounted levers forming extensions of the tongs, each lever being pivoted to the back end of the tongs and the back ends of the levers being connected one with another by a tension spring, and a cam disc rotat-
able between said levers to control the opening and closing movements of the jaws of the tongs.

12. A machine as set forth in claim 2, said mechanism including a clamping tongs connected with a carrier body, swivelling about an adjustable pivot, means for adjusting the pivot, governing means for moving the carrier body with the clamping tongs about said pivot to effect the feed of the work-piece, and means for opening and closing the jaws of the clamping tongs.

13. A machine as set forth in claim 3, said mechanism including a clamping tongs connected with a carrier body, swivelling about an adjustable pivot, means for adjusting the pivot, governing means for moving the carrier body with the clamping tongs about said pivot to effect the feed of the work-piece, and means for opening and closing the jaws of the clamping tongs.

14. A machine as set forth in claim 3, said mechanism including a clamping tongs connected with a carrier body, swivelling about an adjustable pivot, means for adjusting the pivot, governing means for moving the carrier body with the clamping tongs about said pivot to effect the feed of the work-piece, and means for opening and closing the jaws of the clamping tongs.

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