POWER-DRIVEN BAR-SWAGING MACHINE

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Fig. 4.

Fig. 2.
This invention relates to improvements in power driven bar-swaging machines of the rotary head type with controllable die members adapted to impact the circumference of bar stock fed axially of the rotary head, whereby to swage said bar stock to reduced diameter.

The invention has for an object to provide an improved construction of bar-feeding mechanism for a bar-swaging machine of the type referred to.

The invention provides in a machine of the type above set forth means for feeding to bar axially of the rotary head, in combination with means operative at preselected stations in the travel of the bar to determine the activity or inactivity of the dies, and means for varying the rate of feed of the bar whereby the bar may be moved rapidly between said stations and at a lower speed during the activity of the dies.

An embodiment of the invention will now be described with reference to the accompanying drawings in which Fig. 1 is a side elevation, partly sectional, and broken to show the figure of a bar-swaging machine with bar-feeding and die-controlling mechanism according to the invention; Fig. 2 is a face view of the swaging head with part removed for clearance; Fig. 3 is a sectional elevation; Fig. 4 is an end view and Fig. 5 a plan of a tractor carriage later to be described; Fig. 6 is a side view to a larger scale of part of a swaged bar showing alternate swaged and unswaged portions.

The same reference characters denote corresponding parts in the several views.

Referring to Fig. 1 of the drawings, 10 indicates the body of a swaging machine of the rotary head type, which, although in part of known construction, will for the purpose of explanation be generally briefly described. 11 denotes the swaging head housing a die carrier 12 located at one end of the usual hollow shaft 13 rotatably mounted in roller bearings, one set of which is indicated at 14. Complemental swaging dies 15, 16 are mounted in the die-carrier 12 and adapted for intermittent sliding movement towards and away from each other under the impact of hammer rollers 17 arranged in spaced relationship around a case 18 located in the head 11, see Fig. 2. 18', 18'' are slide blocks each furnished with a roller 20', 20'', respectively, adapted for rolling contact with the hammer rollers 17. Interposed between the slide blocks 18', 18'' and the swaging dies 15, 16 are wedge members 21', 21'', each operatively connected at one end to a further hollow shaft 22 disposed for sliding movement in the hollow shaft 13.

The die controlling movement of the shaft 22 is effected by a hydraulic device consisting of a hydraulic ram inside a cylinder 23 fitted with a piston 24 having a piston rod 25 operatively connected to one arm of a bell-crank lever 26 pivotally mounted at 27 in a bearing bracket 28 situated adjacent to the outer end of the machine 10. The other arm 29 of the lever 26 is connected, as by a pin-and-slot connection, to the outer end of the hollow shaft 22. The ram is controlled by a hydraulic reversing relay valve 30' unitary with a double-armed lever 29 to the opposite arms of which are connected two endwise movable rods 30, 31 extending in parallelism with the track of a bar-feeding carriage 32. The aforenamed track is formed by pairs of channel-iron members 33, 34 carried by stanchions 35 arranged at spaced intervals according to the length of track required and braced together to form a unitary track-carrying bridge. The endwise movable rods 30, 31 are further supported by two-armed levers 29', 29'' pivotally mounted on the respective adjacent stanchions 35.

Operationally associated with the hydraulic ram is a start-and-stop limit switch for a motor-driven pump unit 36 which supplies pressure fluid (oil) to the ram through the medium of a hydraulic reversing valve 37 controlled by the relay valve 38. The supply of oil to the hydraulic ram is controlled to vary the speed of movement of the lever 29 by means of a throttle control valve 39 intercalated in the pipe line 39 to the relay valve 38. One side of the reversing valve 37 is piped at 40, 41 respectively, to one side of the relay valve 38 and to the cylinder 23 below the piston 24. The other side of the reversing valve 37 is piped at 42, 43, respectively, to the other side of the relay valve 38 and to the cylinder 23 above the piston 24. The reversing valve 37 is also piped at 44 to the sump of the pump unit 36, and the throttle control valve is piped at 45 to the reversing valve 37. The carriage 32 is provided with upper and lower sets of wheels 46, 47 to run on the tracks formed by the channel members 33, 34. The carriage 32 is provided with an adjustable bar-gripping chuck 48 rotatably mounted in ball-bearings 69 in the forward end of the carriage 32. The jaw members 50 of the chuck are movable relatively to the chuck body 48 by means of a push 51 screwed into the body 48 and turnable by means of a tommy-bar inserted in one of a set of holes 52 in the flange of the bush 51. The chuck body 48 is turnable by means of a tommy-bar inserted in one of a set of holes 53 in the flange 48' of the chuck body. To retard ultra-free turning movement of the chuck, there is provided a brake consisting of a metal block 54 with an arcuate face having a friction lining 55 yieldingly held in contact with the periphery of the flange 48' by means of springs 56 located in recesses 57 in the block 54 and in holes 58 in the carriage 32, see Figs. 3 and 5. The holes 58 are normally closed by removable screw-threaded plugs 59, see Fig. 3.

The carriage 32 is provided on one side with
a projecting block 60 in which is slidably mounted a striker 61 projecting above and below the block 60 and adapted for movement transversely of the path of the carriage 32 by engagement with adjustable stop members or cams 62, 63, on the movable control rods 30, 31, respectively, of the hydraulic relay valve 28'. The adjustable stop members or cams 62, 63 are mounted in spaced relation on the rods 30, 31 in positions which determine the length of the swaged portions of the bar stock relatively to the unswaged portions.

For effecting traverse of the carriage 32, there is provided a rotary lead screw 64 which is engageable by a split nut member 65 mounted in the floor of the carriage 32. The lead screw 64 is adapted to be driven by a variable speed electric motor 66 through the medium of speed-reduction gearing 67. The housing of the motor and the reduction gear is carried on a stand 68 at the end of the bridge. The electric motor 66 is speed-controlled by a control switch operated by a linkage 69 connected to the two-armed lever 23' of the endwise movable control rods 31, 32, see Fig. 1.

The mechanism is so arranged that the carriage 32 travels quickly when the swaging head is not operating on the bar stock and relatively slowly while the swaging head is operating on the bar stock.

The split-nut member 65 of the carriage 32 is adapted for restricted vertical movement in a slideway 70. A stud 71 is secured in the nut member 65 with freedom for turning movement thereon and projects upwards through a flanged bush 72 formed with a cam profile 73 on its upper face. The stud 71 is furnished with a handle 74 adapted to contact with the cam profile 73 whereby turning movement of said handle will cause the nut member 65 to be moved up or down in the slideway 70 to release it from or put it into engagement with the lead screw 64. When the nut member 65 is engaged with the lead screw 64, the handle 74 is engaged in a notch 75 formed in the boss of the bush 72 whereby to prevent accidental displacement of the nut member 65.

In the operation of the machine one end of the bar stock A to be swaged projecting through the swaging machine 10 is gripped by the jaws 50 of the chuck 48; the cams 62, 63 are set on the control rods 30, 31 in predetermined positions to govern the length of the swaged parts of the bar stock relatively to the unswaged parts; and the machine is "started up."

As shown in Fig. 1, the parts are in the swaging position, oil from the pump unit 36 passing through the throttle control 38 via the pipe lines 39 to the relay reversing valve 28', and thence by the pipe lines 40 and 43 and main reversing valve 37, is holding the piston 24 in its lowest position thereby causing the lever 26 to retain the wedges in operative position against the dies. Rapid rotation of the die-head 12 causes the dies 45, 46 to be subjected to recurrent blows as the rollers 29', 29" are successively acted upon by the hammer rollers 17', 17".

The carriage 32 is drawn along the tracks by means of the lead screw 64 until the striker 61 abuts against a cam stop 62, thus moving the control rod 30 to actuate the reversing valve 28' to change the flow of oil to the cylinder 23. Oil then passes to the underside of the piston 24 via the pipe lines 40, 41 and forces the piston 23 upwards whereby to rock the lever 26 and to cause the wedge members 21', 21" to be withdrawn to free the dies and permit the bar stock to be drawn through said dies without being swaged. Further movement of the carriage 32 causes the striker 61 to abut against a cam stop 63 on the other control rod 31 to actuate the reversing valve 28' in the opposite direction and again reverse the direction of flow of the oil, whereby the wedges 21', 21" are caused to return to operating position to hold the dies together. This reversing movement continues alternately as the striker 61 meets successive cams on the rods 30, 31.

The mechanism is so arranged that the carriage 32 travels quickly when the swaging machine is not operating on the bar stock, and relatively slowly while the machine is operating on the bar stock.

After each feeding traverse, the carriage 32 may be restored manually to starting position by releasing the chuck, by causing the split nut member 65 to disengage itself from the lead screw 64, and by pushing or pulling the carriage back along the track to starting position.

What is claimed is:

1. In a bar-swaging machine of the rotary head type, with die members adapted to impact the circumference of bar-stock fed axially of said head whereby to swage the said bar-stock to reduced diameter, the combination of bar-feed mechanism including a carriage, means for moving said carriage parallel to the axis of said head, a chuck fitted to said carriage and engageable with said bar-stock, wedge members shiftable to render the dies operative or inoperative, an endwise movable hollow shaft coaxial with said bar-stock and operatively connected to said wedge devices to shift said wedge devices from die-operative position to die-inoperative position, a hydraulic device for effecting axial movement of said hollow shaft, said hydraulic device consisting of a hydraulic ram including a cylinder, a piston movable in said cylinder, a piston rod fixed to said piston and operatively connected with said hollow shaft, a pump unit having a pipe connection to said hydraulic ram, a reversing valve intercalated in the pipe connection between said pump and said ram to control the operation of said ram, a double-armed lever unitary with said valve, a pair of endwise movable rods extending in parallelism with the track of the carriage and connected to the arms of said lever, and means on said carriage operable in the travel of said carriage to move said rods alternately in opposite directions to reverse said valve.

2. In a bar-swaging machine, the combination claimed in claim 1, including a carriage track extending parallel to the axis of the rotary head, a frame carrying said track, a lead screw journaled in said frame, a variable speed motor for driving said lead screw, a split nut member in said carriage for engagement with said lead screw, and a switch for controlling the speed of said motor, said switch operatively connected to said endwise movable rods.

3. In a bar-swaging machine, the combination claimed in claim 1, including adjustable cam stops on the endwise movable rods, and a striker on the carriage engageable with said cam stops.

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