ABSTRACT OF THE DISCLOSURE

An upset-testing machine for bar stock, comprising at least one shearing die with a through-hole for receiving an end of the test bar, a member guided with reference to said die for cropping a sample length from said bar, a first fluid-pressure ram for actuating said cropping member, an anvil disposed in the line of movement of said cropping member, a member for locating said sample during transference thereof from said die to said anvil, a second fluid-pressure ram acting on said locating means in opposition to said first ram, and a third fluid-pressure ram movable perpendicularly to said anvil to upset said sample while in contact therewith.

This invention relates to the testing of bar stock produced in a rolling mill for imperfections. It is common practice to check the quality of rolled bar stock by taking one or more samples of the stock in the form of a short length cut from the bar and performing on the sample an upsetting operation. In this operation a sufficient, preset, load is applied to the axial end faces of the sample to reduce its length to about 80% of its original length. The length of a good quality sample may finish even further reduced but this is largely incidental to the test, the purpose of which is to make a good quality sample reveal its quality by splitting radially and longitudinally thereof.

Samples may be taken once per 100 feet of stock or at much more frequent intervals, perhaps even once in every 10 feet. The frequency of testing is largely decided by the customer but taken as an average daily activity, the work involved creates a formidable production problem, especially in view of the present tendency for the formation of fewer, specialised, plants and greatly increased outputs per plant.

The established practice is simply to saw off the required sample and then apply the upsetting load using a standard hydraulic press; but such a method is costly in time and involves much manual handling. Also it is difficult to obtain a thoroughly consistent prestressed sample. It is, for example difficult to saw parallel faces and cut to exact lengths.

Other methods have been tried with some improvement in respect of the above disadvantages—such as the use of a power guillotine and the use of jigs—but such methods either have not removed the manual handling of the sample, or have involved the use of complicated mechanisms to obtain, and position, the sample prior to upsetting, or to remove the sample after upsetting.

The present invention envisages the provision of an automatically controlled machine for cropping and upsetting a sample whereby the only manual operations are those of inserting a bar to be tested a short distance into a horizontal duct of the machine, operating a push button, and subsequently inspecting the upset sample.

In an upset testing machine according to the invention a sample of a bar inserted into the machine is cropped from the bar by the actuation of a first hydraulically or pneumatically operated ram, is then carried to an anvil by a transfer member actuated by a second hydraulically or pneumatically operated ram and is finally upset tested on the anvil by a third hydraulically or pneumatically actuated ram.

The operations of cropping and upsetting are performed using a minimum of moving parts which comprise three hydraulic rams and their associated hydraulic power equipment.

The machine can, of course, be arranged so that the final act of loading causes the ensuing operations to automatically follow on but it has been found convenient in the preferred embodiment of the invention to leave the initiation of the follow on under the control of the operator.

So that the invention will be better understood an example of a machine in accordance with it will now be described with reference to the accompanying drawings in which:

FIGURE 1 is diagrammatic and shows a general arrangement of a cropping upset testing machine in accordance with the invention;

FIGURE 2 is diagrammatic and is a view in the direction of the arrows A-A in FIGURE 1, a part being omitted for the sake of clarity;

FIGURE 3 is a sectional through an actual machine according to the invention, the section being taken on the line III-III of FIGURE 2; FIGURE 4 is a section on the line IV-IV of FIGURE 3; and FIGURES 5, 6, 7 and 8 are diagrammatic and show the parts of the machine in various stages of its operation.

Referring now to the drawings a sample 2 is cropped from a bar 4 between a pair of vertical shear dies 6 by a cropping member 8 actuated by a hydraulically operated cropping ram 10. The bar is withdrawn from the machine but that part 9 which is beyond the sample remains in the machine until a subsequent bar is inserted. The sample 2 is transferred to the upsetting station 12 (i.e. the position shown in FIGURE 6) on the vertical face of an anvil 14 by the actuation of another ram 16 (i.e. the so-called "transfer ram") which has a transfer member 18 for carrying the sample 2 and which is displaceable along a line coaxial with the cropping ram 10.

The transfer member 18 is moved up to the sample as shown in FIGURE 5 before cropping occurs. Thus the transfer motion is an extension of the cropping motion. This transfer motion as will be seen from FIGURE 2 occurs along a line which lies in the vertical plane and which is disposed at an angle to the horizontal. An angle of 45° is preferred.

The end face of the transfer member 18 is horizontally grooved at 20 (FIGURE 4) to receive the cropped sample 2 in a manner which will allow the sample 2 to remain therein without tendency to fall out once the cropping ram 10 is withdrawn. The cross sections of both the transfer member 18 and cropping member 8 are preferably rectangular with the smallest side of the rectangle in both cases being arranged parallel to the longitudinal direction of the sample. In the case of the cropping member 18 the length of this side must be identical to the longitudinal dimension of the sample, and hence before the upsetting operation can commence the cropping ram 10 must be withdrawn from the sample. The transfer member 18, however, has a smaller width for a reason which will become more apparent later.

A third or upsetting ram 24 is displaceable in a direction which is normal to the vertical plane and it is disposed along a line which is coaxial with the sample when that has been transferred to the upsetting station on the anvil 14 which is the position shown in FIGURE 6. When the sample 2 reaches the upsetting station 12 the crop-
member 8 is withdrawn by the cropping ram 10 and the third ram 24 nips the sample against the anvil 14 (FIGURE 7). The transfer ram 16 then withdraws the transfer member 18 and the upsetting load is then applied to the sample as shown in FIGURE 8. The upsetting ram 24 is then withdrawn, and the sample 2 becomes free to drop vertically into a chute which conveys it out of the machine for inspection.

By use of the machine of the invention a minimum of bar is wasted, it being necessary to lose only sufficient to allow the bar to project, upon loading, slightly beyond the die set 6. When the next bar is inserted into the machine the wasted end 9 of the previous bar is pushed out of the far die into a container or onto a separate chute which conveys it to an external container. To prevent too much bar being wasted a positive stop can be provided, but provision may then have to be made to temporarily remove the stop before the next test is started so that the wasted end can be pushed out of the die and thus allow the end of the new bar to take its place. The stop should be restored to the proper position before the next operation and various well known simple mechanical contrivances can be employed for this purpose.

It is possible, by the use of a single die, not to waste any stock but the sample obtained by this method is inferior by virtue of sideways distortion due to the unsymmetrical bending moment applied to the end of the bar during the shearing operation. Furthermore, the end faces of the sample may not be parallel and this is an essential requirement if the test is to be meaningful.

The control apparatus needs be only of the simplest kind whereby interlocks ensure proper sequence of events and the correct loading of the upsetting ram is ensured. Limit switches operable by the cropping ram can be used to establish the position of the upsetting station.

In a trial operation of a machine according to the invention it was found possible to average up to 360 tests per hour.

While a hydraulically actuated machine has been described above it is also possible to employ pneumatic actuation.

I claim:

1. An upset testing machine for bar stock, comprising at least one shearing die provided with a through-hole for receiving an end of the test bar, a cooperating shearing member guided in said die in a passage which intersects said through-hole, a first fluid-operated ram for moving said shearing member along said passage to crop a predetermined length of specimen out of said bar and displace said specimen beyond said die, a rigid surface aligned with said passage and adapted to support said specimen after displacement as aforesaid and during application of a test force thereto, a member movable across said surface into and out of said die passage and adapted to locate said specimen during transference thereof from said die to a test position on said supporting surface, a second fluid-operated ram acting on said locating member in opposition to said second ram but applying only enough pressure to retain said specimen in contact with said shearing member during movement of said specimen thereby to said test position, and a third fluid-operated ram movable perpendicularly to said supporting surface to apply a force of predetermined magnitude and duration to said specimen on arrival thereof at said test position, said locating member being positively retracted from said specimen by said second ram prior to application of said test force.

2. An upset testing machine according to claim 1 in which the line of action of the first and second rams is common to the two rams and in a vertical plane and in which the line of action of the third ram is at right angles to the said vertical plane.

3. An upset testing machine according to claim 2 in which the said line of action is at an angle to the horizontal.

4. An upset testing machine according to claim 3 in which the angle is 45°.

5. An upset testing machine according to claim 1 having means whereby the second ram holds the specimen on the surface until the specimen is nipped by the third ram whereafter the said second ram is withdrawn.

6. An upset testing machine according to claim 1 having means whereby, when the said second ram is withdrawn after the test is complete, the tested specimen is discharged from the machine.

7. An upset testing machine according to claim 1 having means for controlling the force applied by the said third ram.

8. An upset testing machine according to claim 1 in which the specimen is cropped from the bar by a member actuated by the said second ram which shears the specimen from between a pair of parallel dies through apertures in which the bar is passed.

9. An upset testing machine according to claim 1 having control means whereby an operator can initiate each separate step in the sequence of operations.

References Cited

UNITED STATES PATENTS
1,839,376 1/1932 Cropper

FOREIGN PATENTS
927,641 5/1963 Great Britain.

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