July 30, 1957 T. E. LEWIS, JR 2,800,814

SLUG-POSITIONER FOR BALL-MAKING MACHINES

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FIG. 1.

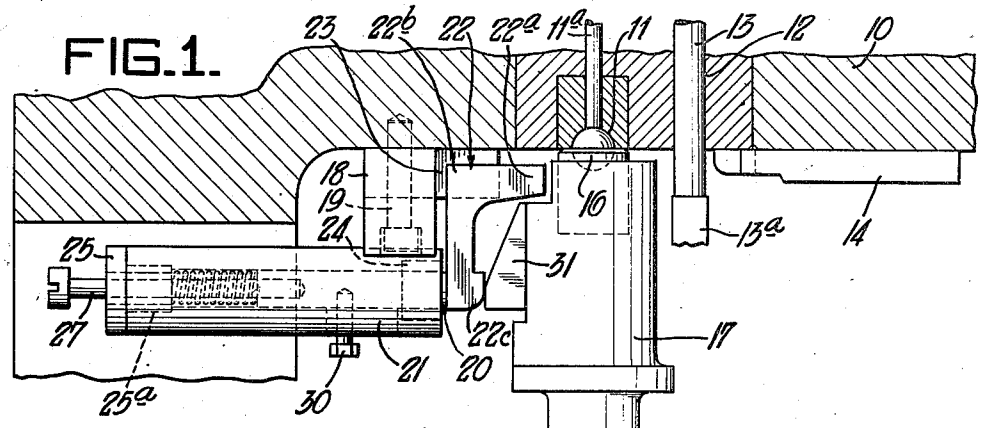


FIG. 2.

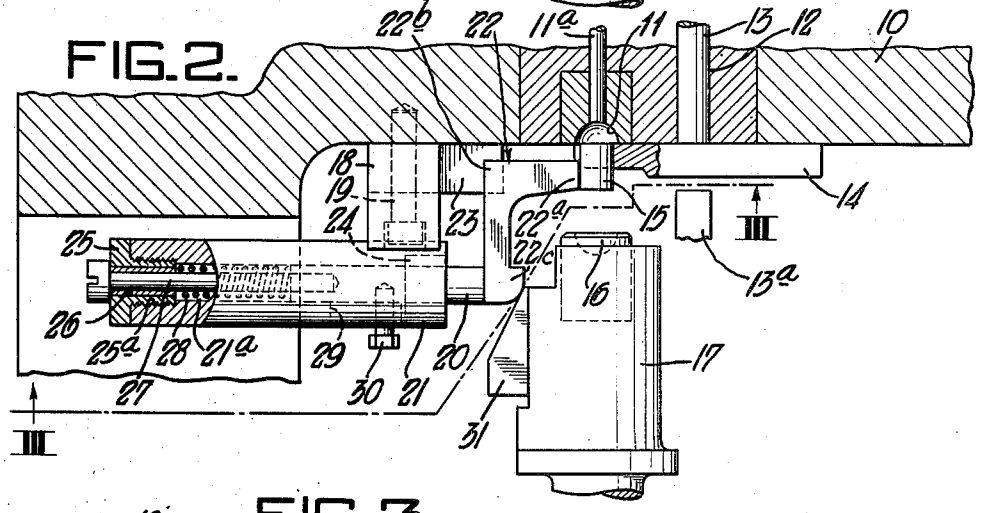


FIG. 3.

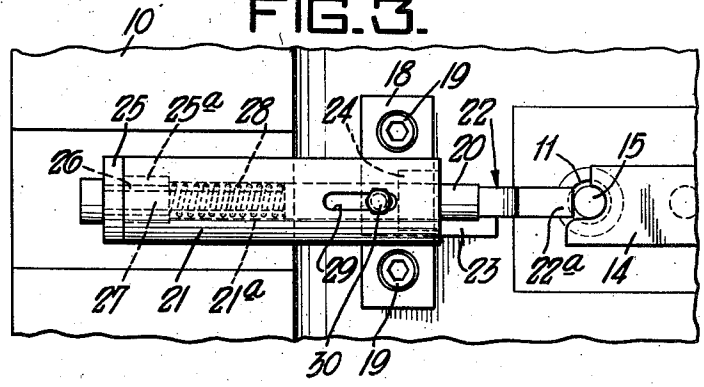
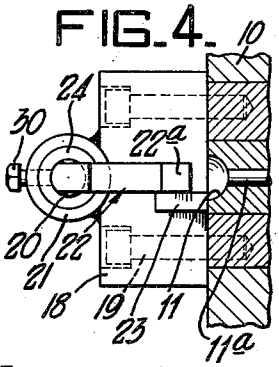


FIG. 4.



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SLUG-POSITIONER FOR BALL-MAKING MACHINES

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4 Claims. (Cl. 78—17)

This invention relates to automatic machines for hot-forging metal slugs and, in particular, to an improved means for positioning a heated slug of metal so it will be properly engaged by a pair of opposed shaping dies.

Steel balls for grinding mills and the like are hot-forged on automatic machines incorporating opposed hemispherical shaping dies and a reciprocating shear blade which cuts off successive slugs from a heated bar and carries them to a position between the dies, one of which reciprocates toward and from the other. Frequently the initial effect of the blade is to misaline slightly or distort the end of the bar protruding from a hole in a shear plate. This causes the axis of the slug to be out of alinement with the common axis of the dies when the slug is sheared off and positioned between the latter. Ball-making machines have therefore been provided with a member adapted to advance between the open dies for positioning the slug in properly alined relation to the dies but the mechanism for actuating such means is complex in structure and difficult to maintain. The positioning member, furthermore, frequently fails to locate the slug accurately with the result that many out-of-round balls are produced which have to be scrapped. It is accordingly the object of my invention to provide a slug positioner for ball-making machines or the like which is very simple, unlikely to get out of adjustment and capable of positioning slugs with such accuracy that the dies properly shape them into spheres within the required tolerance limits.

In a preferred embodiment of my invention, I provide a guide immediately adjacent the forming dies and mount therein for reciprocation toward and from the dies a plunger having a finger thereon adapted to project between the dies when they are open, i. e., when the reciprocating die is retracted from the fixed die. I also employ means constantly urging the plunger toward the dies and provide a stop to determine the inwardmost position of the plunger and finger. Finally, I utilize means moving with the reciprocable die to displace the plunger and retract the finger to an out-of-the-way position as the die is pressed home.

A complete understanding of the invention may be obtained from the following detailed description and explanation of the present preferred embodiment illustrated in the accompanying drawings. In the drawings,

Figure 1 is a plan view showing the improved positioner with the parts in the positions they occupy at the end of one operating cycle and the start of the next;

Figure 2 is a similar view showing the plunger fully retracted and the moving die partially retracted;

Figure 3 is a sectional view taken along the plane of line III—III of Figure 2, showing parts in elevation; and

Figure 4 is an end elevation such as would be seen by looking from the right of Figure 3.

Referring now in detail to the drawings and, for the present, to Figure 1, a ball-making machine comprises a main frame **10** having a fixed hemispherical die **11** seated therein provided with a spring-pressed ejector pin **11***a*.

A hole **12** in the frame adjacent die **11** permits a bar of steel **13**, heated to forging temperature, to be advanced step-by-step by any suitable feeding means (not shown) into engagement with a gage stop **13***a*. A shear blade **14** reciprocates on a line through the axes of hole **12** and die **11**, normal to both, thereby severing slugs **15** successively from the bar. The cutting end of the shear blade is so shaped that, after shearing each slug, it carries the slug forward into position for shaping between die **11** and a similar, opposed cooperating die **16** seated in a head **17** reciprocating toward and from die **11**. The reciprocation of the shear blade and the moving die are properly coordinated time-wise by known means to give the desired order of operation. The parts described thus far are conventional and form no part of my invention.

My improved slug positioner is mounted on a block **18** secured to frame **10** adjacent die **11** by screws **19** and comprises a plunger in the form of a rod or bolt **20** reciprocable in a guide such as a tube or barrel **21** having a bore **21***a* therethrough. The barrel is disposed normal to the common axis of the dies **11** and **16**, as by welding to block **18**, preferably so that bolt **20** reciprocates in a path parallel to that of the shear blade **14**. Bolt **20** has at the forward end thereof a laterally and forwardly projecting positioning finger **22** of L-shape including a shank and a tip. The extreme forward end or tip **22***a* of the finger is adapted, when bolt **20** is in the position shown in Figure 2, to position the slugs **15** as advanced successively by the shear blade. The rear, laterally disposed corner **22***b* of the finger slides on a horizontal bearing plate **23** secured to the bottom of block **18** and extending inwardly toward die **11**. Bolt **20** slides in a bushing **24** seated in the inner end of bore **21***a*.

A cap **25** has a threaded neck **25***a* screwed into the outer end of the barrel **21** and is fitted with a bushing **26**. A stop screw **27** slidable in bushing **26** is screwed home tightly in the outer end of bolt **20** and has a coil spring **28** thereon compressed between the outer end of the bolt and the inner end of bushing **26**. The spring thus constantly urges the bolt inwardly until the head of screw **27** engages the outer face of cap **25** and the length of the screw determines the inwardmost position of finger **22**. Barrel **21** has a longitudinal slot **29** therein to admit a screw **30** entering bolt **20** radially. Screw **30** serves merely as a safety stop in the event of breakage of screw **27**. It also prevents rotation of the bolt **20** should there be any tendency for finger **22** to kick upwardly.

The effective position of finger **22** is that shown in Figure 2, and the finger is normally held in such position by spring **28**. The finger must be retracted to an out-of-the-way position, however, in order to permit die **16** to close on die **11**. For this purpose, I mount a wedge block **31** on the side of head **17** adjacent barrel **21**. The finger **22** has a rounded portion **22***c* adapted to be engaged by block **31**, as head **17** advances to execute a forging stroke, thereby displacing the finger and forcing bolt **20** into barrel **21** against the force of spring **28**. Thus the finger is moved out of the way of the advancing die as the latter is pressed home against die **11**.

The complete operating cycle will now be described, commencing with the completion of one forging operation as illustrated in Figure 1. Die **16** having reached its extreme forward position, is first retracted with head **17** on its reverse stroke. Ejector pin **11***a* thereupon kicks out the ball formed between the dies. As die **16** moves rearwardly, bolt **20** advances under the pressure of spring **28** to the limit permitted by engagement of surface **22***c* of finger **22** with wedge block **31**, the final position of the finger being determined by the length of screw **27** as aforesaid. As a result, when block **31** finally separates from surface **22***c*, the bolt is advanced so that the tip por-

tion 22*a* of the finger is in its inwardmost position to locate the next slug.

In the meantime, shear blade **14** has advanced to engage the end of bar **13**, sever the next slug **15** and carry it to a position between the dies. The outer end of the slug engages finger **22** and the slug is thereby turned slightly in a horizontal plane so that its axis coincides with that of the dies. This condition of the parts is shown in Figure 2. The travel of the shear blade, of course, is determined so it will just suffice to place the slug between the dies. In case of misalinement of the slug, the finger serves to turn it slightly into accurate alinement with the common axis of the dies as the head **17** advances to close die **16** on die **11**. As head **17** advances, bolt **20** and finger **22** are displaced out of the way of die **16** by block **31**, just before the die engages the slug. As soon as die **16** has engaged the slug and pushed it into die **11**, the shear blade is retracted to effect the transfer of the slug in space from the shear blade to the dies and to permit final closing of the dies. At the same time, bar **13** is fed forward against gage stop **13***a* in preparation for the cutting off of the next slug.

It will be understood that stop screw **27** is bottomed in the hole in the outer end of the bolt **20** and is fixed for the size of bar being worked so as to stop the travel of the finger toward the dies at its proper position. A unit consisting of screw **27**, bolt **20** and finger **22** is provided for each particular bar size and the required unit for the size bar to be worked is placed in the machine while making ready for the run. To change to a different size, the screw **27** is removed, the bolt **20** and finger **22** are withdrawn from the barrel **21** and a unit particularly designed for the new size is put in place.

The positioning means shown and described herein has several important advantages. In the first place, it is very simple in structure including only one moving part and one point of working contact. Poor alinement of the slugs with the dies and the mis-shaping of balls resulting therefrom have been minimized as well as the delays in production formerly necessary for the purpose of adjustments. As a result, a substantial increase in production per day has been achieved, as well as a reduction in scrap loss.

Although I have disclosed herein but a preferred embodiment of my invention, I intend to cover as well any change or modification which may be made without departing from the spirit and scope of the invention.

I claim:

1. A device for accurately positioning a slug when pushed into alinement with a fixed die from a point laterally thereof by a reciprocating shear blade for engagement by a movable die reciprocating toward and from said fixed die, said device comprising a cylindrical barrel mounted on said fixed die normal to the path of said movable die, the axis of said barrel lying in the plane determined by said die path and that of said blade, a bolt reciprocable in said barrel toward and from the die path, a head on said bolt extending normal thereto and a finger on said head parallel to said bolt adapted to project between the dies when the movable die is retracted and to arrest a slug being advanced by said blade to position for shaping between said dies, means urging the bolt toward said die path, means limiting movement of the bolt toward said die path and coacting surfaces on said movable die and said head effective to retract said bolt as the movable die advances toward the slug.

2. The apparatus defined by claim 1, characterized by said movement-limiting means including a screw extending longitudinally into said barrel and threaded into said bolt.

3. The apparatus defined by claim 1, characterized by said coacting surfaces including a wedging block on the movable die adapted to engage the inner end of said bolt.

4. The apparatus defined by claim 1, characterized by a bearing plate slidably supporting said head adjacent said finger.

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