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COMPLETE SPECIFICATION

Multi-Station Forming Press for Forming Sliders for Sliding
Clasp Fasteners

I, TADAO YOSHIDA, of 339, 2-chome, Suwadacho, Ichikawa-shi, Chiba-ken, Japan, a Japanese citizen, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a multi-station forming press.

The invention provides a multi-station forming press for the production of the slider of a sliding clasp fastener, comprising a base plate, a platen reciprocable towards and away from the base plate, a line of nine forming stations comprising dies which are replaceably affixed to the platen and which, on reciprocation of the platen, can cooperate with dies replaceably affixed to the base plate to perform the following nine operations in succession on a strip of material fed into the press, namely:—

1. trimming the corners from the leading edge of the strip;
2. cutting a dumb-bell-shaped slider blank having four outer converging edges, four inner covering edges and a waisted portion, and discarding the waste material;
3. flanging over the four outwardly converging edges of the blank with a drawing action;
4. forming a slot in the slider blank;
5. forming a handle fixing part by making a slit on each side of the centre line of the strip and forcing a bridge portion between the two slits out of the plane of the rest of the blank;
6. shaping the handle fixing part to give it a T-shaped cross-section;
7. flanging over the four inwardly converging edges of the blank with a drawing action;
8. cutting to separate a blank from the rest of the strip;
9. bending the blank about the waist por-

tion, and stamping the bend to complete the forming of the slider;

and also comprising a forwarding device for forwarding the strip of material from one station to the next at each stroke of the press.

The press thus performs nine complicated pressing, cutting and bending operations at each stroke and produces one complete slider at each stroke; the efficiency of this procedure is high.

It will be noted that substantially the whole of the waste is removed at an early stage in the forming of the slider, and it should also be noted that the drawing action in operations 3, 5 and 7 has a strengthening effect. These two features lead to economy in the production of the sliders. Another advantage is that the dies, being replaceable, can readily be exchanged if they give trouble.

The invention is illustrated by the accompanying drawings, in which:—

Figure 1 is a plan view showing the results of the nine operations in forming a slider from a strip of material;

Figures 2 and 3 are side views of parts of the slider;

Figure 4 is a longitudinal section of a finished slider;

Figure 5 is an end view of a finished slider;

Figure 6 is a side view of a finished slider;

Figure 7 is a longitudinal section of a press for carrying out the operations illustrated in Figure 1;

Figure 8 is a plan view of the reciprocable upper platen of the press;

Figure 9 is a plan view of the base plate of the press;

Figure 10 is a cross-section taken on the line A—A Figure 7, and shows the reciprocable platen in the closed position and how a spring holder 8 and a side jaw 26 co-operate;

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Figure 11 is a cross-section taken on the line B—B of Figure 7; and

Figure 12 is a part of Figure 11 on an enlarged scale, and indicates at C—C the surface of the base plate.

Referring now to the drawings of the press, a platen 45 is reciprocable towards and away from a base plate 46; a guide pin 48 slides in a guide support 47 to guide the reciprocating platen. The platen 45 has a line of dies replaceably fixed to it by means of supporting pieces 38, 39 and 40 which can be tightened by means of a pin and bolt, and the base plate 46 has a corresponding line of dies fixed to it by means of supporting pieces 41a, 41b, 42a and 42b which can be tightened by means of a pin and bolt. A forwarding device (not shown) is provided for forwarding strip material from one pair of dies to the next at each stroke of the press.

Therefore, one stroke of the press can perform the following operations, namely:—

1. trimming the corners from the leading edge of a strip of material and stamping with internal die 1 and external dies 15 and 16. (Operation I of Figure 1);

2. cutting a dumb-bell-shaped slider blank by means of an internal die 2 and an external die 17. (Operation II of Figure 1). During this operation, only a limited quantity of waste is yielded, and this waste material is discarded and removed from the press via an exit in the base plate 46;

3. forming the external shape of the blank by flanging over, with a drawing action, the four outwardly converging edges of the blank by means of an internal die 3 and guide piece 4 which cooperate with an external die 19 having a spring S_5 mounted in a spring holder 18. (Operation III of Figure 1). At the end of this operation the blank which has been forced into the external die 19 by the internal die 3 is pushed back above the external die by a plunger 20 urged by the spring S_5 when the internal die 3 rises, so that there is no difficulty in forwarding the blank to the next station; the guide piece 4 acts as a stop to ensure that the blank is in the correct position before it is moved forward;

4. forming a slot in the slider blank with an internal die 6 and an external die 23. (Operation IV of Figure 1).

In this operation, a lateral jaw 21 slidable in a tempered channel 55 is operated by a cam 5 supported and guided by a support 22 to adjust the lateral position of the slot, and furthermore the waste is removed from the press via a waste passage in the base plate 46;

5. forming a handle fixing part by making a slot on each side of the centre line of the strip, which is supported from below by member 43, by means of an internal die 7 and an external die 24, leaving a bridge running

down the centre of the strip between the slits, and forcing a portion of this bridge out of the plane of the blank with a drawing action utilising the tensile strength of the material. (Operation V of Figure 1). After this operation, the handle fixing part which has been forced into the external die 24 is pushed back above the external die by a spring S_4 mounted in a spring holder 53, so that there is no difficulty in forwarding the blank to the next station;

6. shaping the handle fixing part by stamping to give the internal surface of this part, which was forced out of the plane of the blank of the previous operations a T-shape. This is done by means of a lateral jaw 26 operated by a cam 9 which is supported and guided in channel 44 by a support 25. (Operation VI of Figure 1).

During this operation the forwarding action comes to a halt and the blank is positioned by front and back guide pieces 36, towards which it is urged by a spring S_2 mounted in a spring holder 8. The vertical position of the blank, and so the level at which it will be struck is determined by the lateral jaw, which is slidable in a tempered channel.

The side jaw is urged laterally by a spring S_1 (Figure 10);

7. flanging over, with a drawing action, the four inwardly converging edges of the blank by means of an internal die 10 and an external die 27. (Operation VII of Figure 1). The internal die 10 also acts as a guide piece;

8. cutting by means of an internal die 11 and an external die 54, to separate a blank from the rest of the strip (Operation VIII of Figure 1). After this operation, the blank that had been pressed down by the internal die 11 is pushed back upwards by a spring S_7 , mounted in a spring holder 28, so that there is no difficulty in forwarding the blank over the external die 54 to the next station;

9. bending and stamping of the blank to give a slider as shown at 1 of Figure 1, the operation being carried out by an internal die 12 and external die 32, with positioning by a lateral jaw 30, and by additional, receiving die 34 for final completion of the slider. (Operation IX of Figure 1). During this operation, a forward movement is imparted to the lateral jaw 30 by a cam 13 supported and guided by a support 31, and a backward movement is imparted by a cam 14 when it cooperates with the other side of a pin 33 fixed on the lateral jaw 30. The forward and backward movement is transmitted to the lateral jaw via a block 29 which is moved back and forth by a pin 33 on each side sliding in a groove in the block 29. The vertical movement during this operation comprises a downward movement by the internal die 12 and an upward movement by a plunger 35 urged by a spring S_4 . During the upward

movement of the platen the lateral jaw 30 is raised by the plunger 35 and moved laterally outwards by the cam 14; the slider, which has been bent about its waist portion by means of the receiving die 34, is pushed above the internal die by the receiving die 34, which is urged by a spring S₁. The slider is ejected by compressed air from a nozzle adjacent to a channel-like extractor 37.

10 Since, as mentioned above, the reinforced part of the slider is hardened and stamped by a drawing action, a press having a capacity of about 30 kilo-tons is required, even though the finished slider may be only small.

15 A slider in accordance with the invention may be two and a half times stronger than the ones hitherto manufactured; the press used is capable of increasing the working efficiency by about 30 times and of reducing the cost of material by about 40 per cent because of the reduced amount of waste. Also, since the press is a combination of units, for example external dies and internal dies, when one unit gives trouble it can easily be replaced.

25 An important advantage of the present invention is that, for the production of a stopper part of a chain of teeth after stamping from a metal plate, there is no need to carry out a bordering operation, i.e. the shaving off of the ridge which forms at the edge during bending; the drawing action which accompanies the bending operations in accordance with the invention prevents the formation of such a ridge, and strong slides can be produced at a great rate without the necessity for a bordering operation.

WHAT I CLAIM IS:—

40 1. A multi-station forming press for the production of the slider of a sliding clasp fastener, comprising a base plate, a platen reciprocable towards and away from the base plate, a line of nine forming stations comprising dies which are replaceably affixed to the platen and which, on reciprocation of the platen, can cooperate with dies replaceably affixed to the base plate to perform the following nine operations in succession on a strip of material fed into the press, namely

50 1. trimming the corners from the leading edge of the strip;

2. cutting a dumb-bell-shaped slider blank having four outer converging edges, four inner converging edges and a waisted portion, and discarding the waste material;

55 3. flanging over the four outwardly converging edges of the blank with a drawing action;

4. forming a slot in the slider blank;

60 5. forming a handle fixing part by making a slit on each side of the centre line of the strip and forcing a bridge portion between the two slits out of the plane of the rest of the blank;

6. shaping the handle fixing part to give it T-shaped cross-section;

7. flanging over the four inwardly converging edges of the blank with a drawing action;

8. cutting to separate a blank from the rest of the strip;

9. bending the blank about the waist portion, and stamping the bend to complete the forming of the slider, and also comprising a forwarding device for forwarding the strip of material from one station to the next at each stroke of the press.

2. A multi-station forming press as claimed in Claim 1, wherein the waste material formed in the second operation is discarded through an opening in the base plate.

3. A multi-station forming press as claimed in Claim 1 or 2, including for the third operation an internal die which is provided with a guide piece and which cooperates with a spring-loaded external die, so that when the internal die is retracted a plunger urged by the spring pushes the blank back above the level of the external die.

4. A multi-station forming press as claimed in any of Claims 1 to 3, including for the fourth operation an internal and external die, a lateral jaw slidable in a tempered channel to adjust the lateral position of the blank, a cam for adjusting the position of the lateral jaw and a waste exit in the base plate through which waste can be expelled from the press.

5. A multi-station forming press as claimed in any of Claims 1 to 4, including for the fifth operation an internal and external die for making the slits and a spring mounted in a holder for pushing the blank above the level of the external die when the internal die is retracted.

6. A multi-station forming press as claimed in any of Claims 1 to 5, including for the sixth operation a cam-operated lateral jaw for carrying out the stamping operation, front and rear spring-loaded guiding pieces for locating the blank before it is struck by the lateral jaw, and a spring for withdrawing the lateral jaw back along a tempered channel.

7. A multi-station forming press as claimed in any of Claims 1 to 6, including for the seventh operation an internal die provided with a guiding piece, and an external die.

8. A multi-station forming press as claimed in any of Claims 1 to 7, including for the eighth operation an internal and external cutting die and a spring, mounted in a spring holder, for pushing the blank above the level of the external die when the internal die is retracted.

9. A multi-station forming press as claimed in any of Claims 1 to 8, including for the ninth operation an internal and external forming die, a lateral jaw for locating the blank, a receiving die for completing the forming of the slider, a pin fixed to the lateral jaw



movement of the platen the lateral jaw 30 is raised by the plunger 35 and moved laterally outwards by the cam 14; the slider, which has been bent about its waist portion by means of the receiving die 34, is pushed above the internal die by the receiving die 34, which is urged by a spring S₃. The slider is ejected by compressed air from a nozzle adjacent to a channel-like extractor 37.

10 Since, as mentioned above, the reinforced part of the slider is hardened and stamped by a drawing action, a press having a capacity of about 30 kilo-tons is required, even though the finished slider may be only small.

15 A slider in accordance with the invention may be two and a half times stronger than the ones hitherto manufactured; the press used is capable of increasing the working efficiency by about 30 times and of reducing the cost of material by about 40 per cent because of the reduced amount of waste. Also, since the press is a combination of units, for example external dies and internal dies, when one unit gives trouble it can easily be replaced.

20 An important advantage of the present invention is that, for the production of a stopper part of a chain of teeth after stamping from a metal plate, there is no need to carry out a bordering operation, i.e. the shaving off of the ridge which forms at the edge during bending; the drawing action which accompanies the bending operations in accordance with the invention prevents the formation of such a ridge, and strong slides can be produced at a great rate without the necessity for a bordering operation.

WHAT I CLAIM IS:—

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2. cutting a dumb-bell-shaped slider blank having four outer converging edges, four inner converging edges and a waisted portion, and discarding the waste material;

55 3. flanging over the four outwardly converging edges of the blank with a drawing action;

4. forming a slot in the slider blank;

60 5. forming a handle fixing part by making a slit on each side of the centre line of the strip and forcing a bridge portion between the two slits out of the plane of the rest of the blank;

6. shaping the handle fixing part to give it 65 a T-shaped cross-section;

7. flanging over the four inwardly converging edges of the blank with a drawing action;

8. cutting to separate a blank from the 70 rest of the strip;

9. bending the blank about the waist portion, and stamping the bend to complete the forming of the slider, and also comprising a forwarding device for forwarding the strip of material from one station to the next at each stroke of the press. 75

2. A multi-station forming press as claimed in Claim 1, wherein the waste material formed in the second operation is discarded through an opening in the base plate. 80

3. A multi-station forming press as claimed in Claim 1 or 2, including for the third operation an internal die which is provided with a guide piece and which cooperates with a spring-loaded external die, so that when the internal die is retracted a plunger urged by the spring pushes the blank back above the level of the external die. 85

4. A multi-station forming press as claimed in any of Claims 1 to 3, including for the fourth operation an internal and external die, a lateral jaw slidable in a tempered channel to adjust the lateral position of the blank, a cam for adjusting the position of the lateral jaw and a waste exit in the base plate through which waste can be expelled from the press. 90 95

5. A multi-station forming press as claimed in any of Claims 1 to 4, including for the fifth operation an internal and external die for making the slits and a spring mounted in a holder for pushing the blank above the level of the external die when the internal die is retracted. 100

6. A multi-station forming press as claimed in any of Claims 1 to 5, including for the sixth operation a cam-operated lateral jaw for carrying out the stamping operation, front and rear spring-loaded guiding pieces for locating the blank before it is struck by the lateral jaw, and a spring for withdrawing the lateral jaw back along a tempered channel. 105 110

7. A multi-station forming press as claimed in any of Claims 1 to 6, including for the seventh operation an internal die provided with a guiding piece, and an external die. 115

8. A multi-station forming press as claimed in any of Claims 1 to 7, including for the eighth operation an internal and external cutting die and a spring, mounted in a spring holder, for pushing the blank above the level of the external die when the internal die is retracted. 120

9. A multi-station forming press as claimed in any of Claims 1 to 8, including for the ninth operation an internal and external forming die, a lateral jaw for locating the blank, a receiving die for completing the forming of the slider, a pin fixed to the lateral jaw 125



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and a pair of cam surfaces which act upon opposite sides of the pin to effect respectively forward and backward movement of the lateral jaw.

9. A multi-station forming press as claimed in Claim 9, wherein the forward and backward movement of the lateral jaw is effected by a block having pins on each side of the jaw and by a guide groove in the block, and
10. the vertical movement of the press comprises a downward movement by the internal die and an upward movement by a spring-loaded plunger which, as the internal die rises, raises

the lateral jaw at the same time as the cam moves the lateral jaw back, whereby the slider formed by bending the blank is pushed back above the internal die by the receiving die and spring, and is then ejected by compressed air from a nozzle adjacent to an extractor.

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