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## (54) Tack shaping apparatus.

(57) A tack shaping apparatus includes a cooperating pair of shaping dies (26, 27) synchronously reciprocably movable toward and away from each other to form a pointed end (30) on the shank (PB) of a tack blank (P). With the synchronous reciprocating movement of the shaping dies (26, 27), the pointed end (30) is accerately aligned with the central axis of the shank (PB).

FIG. 2A

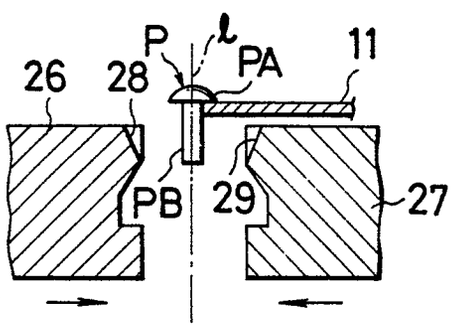
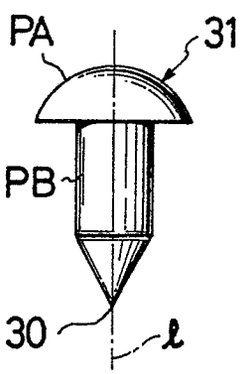



FIG. 2C

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# TACK SHAPING APPARATUS

The present invention relates to a tack shaping apparatus for forming a sharp point of a tack used for garment fasteners such as buttons and snap fasteners.

One known tack shaping apparatus includes, as shown in Figures 3A and 3B, a movable shaping or pointing die 1 adapted to be driven by a ram (not shown) to horizontally reciprocate toward and away from a stationary die 2 for pointing the distal end of a cylindrical shank PB of each tack blank P while the tack blank P is supported on a circular feed plate 3 with the shank PB vertically received in one of a plurality of circumferentially spaced peripheral slots 4 in the feed plate 3. The movable and stationary dies 1, 2 have opposed shaping recesses 5, 5 substantially complementary in contour to a desired pointed end to be formed on the shank PB. In forming a pointed end, the feed plate 3 is intermittently rotated to feed the tack blanks P one at a time to a position adjacent to the shaping recess 5 in the stationary die 2, and while the feed plate 3 is held at rest, the movable die 1 is advanced toward the stationary die 2 to thereby sharpen the distal end of the shank PB by and between the shaping recesses 5, 5.

The known apparatus of the foregoing construction is however disadvantageous in that the tack blank P tends to tilt when subjected to a lateral force or pressure applied by the movable die 1 as the movable die 1 advances toward the stationary die 2. With this tilting, a shaped or finished tack P' has a pointed end PC which has an asymmetrical shape and is displaced off the central axis of the shank PB, as shown in Figure 3C.

With the foregoing drawback in view, the present invention is aimed at the provision of a tack shaping apparatus capable of forming a tack having a pointed end which is held in alignment with the central axis of a shank of the tack.

According to the present invention, there is provided a tack shaping apparatus for forming a pointed end on a shank of a tack blank, comprising: a cooperating pair of shaping dies jointly defining centrally therebetween a working station where the shank of tack blank is to be supported, said shaping dies being sinchronously reciprocably movable toward and away from each other with respect to said working station.

Many other advantages and features of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

Figure 1 is a diagrammatical plan view of a tack shaping apparatus embodying the present invention;

Figures 2A and 2B are vertical cross-sectional views of a portion of the apparatus shown in Figure 1, illustrating the manner in which a sharp point is formed on the shank of a tack blank;

Figure 2C is an enlarged front elevational view of a finished tack shaped on the apparatus of Figure 1;

Figures 3A and 3B are views similar to Figures 2A and 2B, respectively, showing the shaping operation of a prior apparatus; and

Figure 3C is an enlarged front elevational view of a tack shaped on the apparatus shwon Figures 3A and 3B.

As shown in Figure 1, a tack shaping apparatus of the present invention comprises a parts feeder 10 for supplying tack blanks P (Figure 2A) one by one to a horizontal circular feed plate 11 through a chute 12. The tack blank P has an enlarged round head PA and a cylindrical shank PB projecting perpendicularly from the head PA. The feed plate 11 includes a plurality of semi-circular guide shots 13 for receiving therein the shanks PB of the respective tack blanks P, the guide slots 13 being defined in an outer peripheral wall of the feed plate 11 at equal circumferential intervals. The feed plate 11 is intermittently rotatable about its own axis to bring one slot 13 in registry with an outlet of the chute 12 so that one tack blank P is delivered onto the feed plate 11 with its shank PB received in the slot 13. The apparatus also includes a pulley 14 driven by a motor through an endless belt (neither shown). The pulley 14 is mounted on one end of a drive shaft 15 so as to rotate the drive shaft 15 in a direction indicated by the arrow when the pulley 14 is driven. The drive shaft 15 is coupled with a pair of parallel spaced crankshafts 16, 17 via a pair of power transmission units 18, 19 for rotating the crankshafts 16, 17 simultaneously in opposite directions indicated by the arrows. One of the units 18 is mounted on the other end of the drive shaft 15 and the other unit 19 is mounted on the drive shaft 15 adjacent to the pulley 14. The power transmission units 18, 19 are of the known type and they are constructed to transmit rotational motion and power from the drive shaft 15 to the crankshafts 16, 17 extending at a right angle to the axis of the drive shaft 15. A preferable example of such power transmission units 18, 19 is a gear device having a bevel gear set or a worm gear set.

The crankshafts 16, 17 have a pair of crank portions, respectively, pivotably connected with a pair of opposed connecting rods 20, 21. The connecting rods 20, 21 are connected at their inner ends to outer ends of opposed first and second rams 22, 23 via flexible couplings 24, 25 to convert rotational motion of the crankshafts 16, 17 to linear reciprocating motion of the rams 22, 23. The flexible couplings 24, 25 preferably comprises an elastomeric coupling which provides high vibration isolation, accommodation of misalignment and long service life without maintenance.

A pair of first and second shaping or pointing dies 26, 27 is secured to confronting inner ends of the first and second rams 22, 23. With this construction, upon reciprocation of the first and second rams 22, 23, the first and second shaping dies 26, 27 are horizontally moved in synchronism toward and away from each other with respect to a working station where each tack blank P is vertically supported by the feed plate 11. As shown in Figure 2A, the first and second shaping dies 26, 27 have a pair of confronting shaping recesses 28, 29 for forming a pointed end 30 (Figure 2C) on the shank PB of the tack blank P.

As described above, the rams 22, 23 are reciprocated by a drive mechanism jointly constituted by the non-illustrated motor, the belt-driven pulley 14, the drive shaft 15, the power transmission units 18, 19, the crankshafts 16, 17, the connecting rods 20, 21 and the flexible coupling 24, 25. The present invention however is not limited to the illustrated drive mechanism but includes any other drive mechanism such as a fluid-actuated cylinder having a piston rod connected directly to each ram 22, 23.

Operation of the tack shaping apparatus thus constructed is described below with reference to Figures 1, 2A and 2B.

While the feed plate 11 is held at rest with one of its peripheral guide slots 13 held in registry with the outlet of the chute 12, the parts feeder 10 delivers a tack blank P to the feed plate 11. The tack blank P thus supplied is supported on the feed plate 11 with the shank PB vertically received in the guide slot 13. Then the feed plate 11 rotates stepwise to bring the next following guide slot 13 into registry with the outlet of the chute 12. A repeated parts supplying operation of the parts feeder 10 and the feed plate 11 causes the leading tack blank P to locate in a working station defined centrally between the first and second shaping dies 26, 27, as shown in Figure 2A. Then the non-illustrated motor is energized to rotate the pulley 14 and hence the drive shaft 15 in a direction indicated by the arrow in Figure 1. This rotational motion of the dirve shaft 15 is converted to a linear reciprocating motion of the first and second rams 20, 21 through the transmission units 18, 19, the crankshafts 16, 17, the connecting rods 20, 21 and the flexible couplings 24, 25. Upon reciprocation of the rams 20, 21, the first and second shaping dies 26, 27 move horizontally in synchronizm with each other toward the working station where the tack blank P is vertically supported on the feed plate 11. As the shaping dies 26, 27 advance toward the central axis $\underline{I}$ of the tack blank P, the distal end of the shank PB is progressively and uniformly compressed or forged from opposite directions by and between the shaping recesses 28, 29. During this shaping operation, the blank tack P is held immovable against tilting, as shown in Figure 2B. As a result, the tack blank P is shaped into a finished tack 31 (Figure 2C) having a pointed end 30 which is symmetrical in shape and is disposed in alignment with the central axis $\underline{I}$ of the shank PB of the tack 31.

As described above, since both shaping dies 26, 27 are reciprocably movable in synchronism with each other toward and away from a working station where each tack blank P is held vertically, the distal end of a shank PB of the tack blank P is shaped into a pointed end 30 which is held in alignment with the central axis $\underline{I}$ of the shank PB. Since the shaping dies 26, 27 are advanced toward each other, shock forces applied to the respective shaping dies 26, 27 are cancelled out when the shaping dies 26, 27 are brought into abutment with each other. Consequently, the tack shaping apparatus produces only a small or negligible vibration during shaping operation.

## Claims

A tack shaping apparatus for forming a pointed end (30) on a shank (PB) of a tack blank (P), comprising: a cooperating pair of shaping dies (26, 27) jointly defining centrally therebetween a working station where the shank (PB) of tack blank (P) is to be supported, said shaping dies (26, 27) being sinchronously reciprocably movable toward and away from each other with respect to said working station.

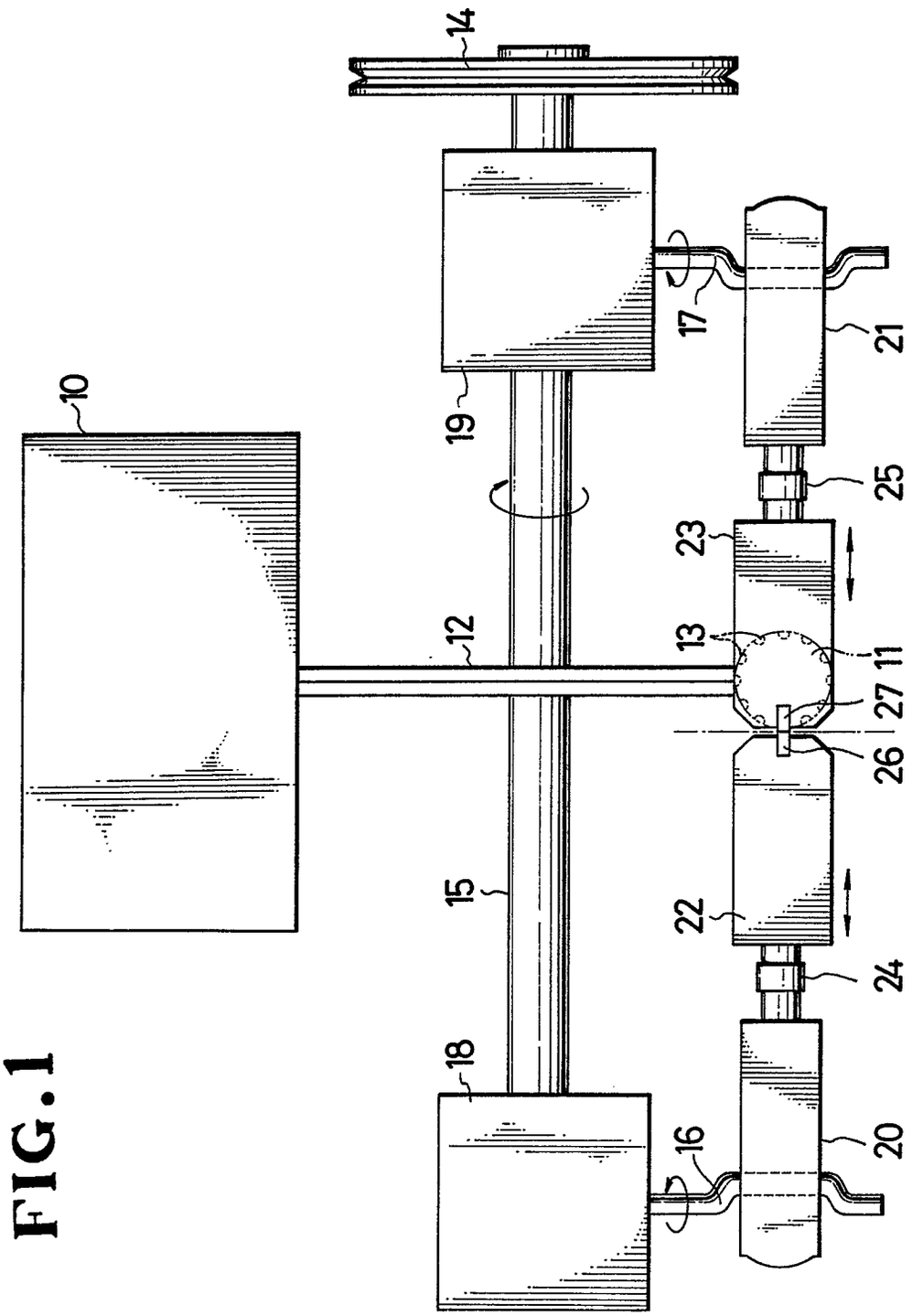


FIG.1

FIG. 2A

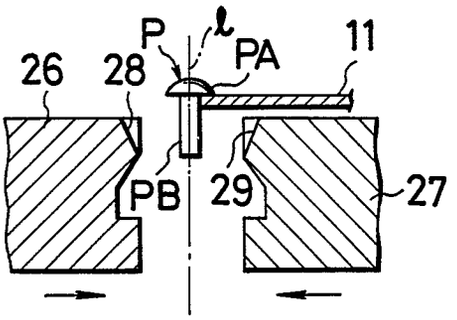


FIG. 3A
PRIOR ART

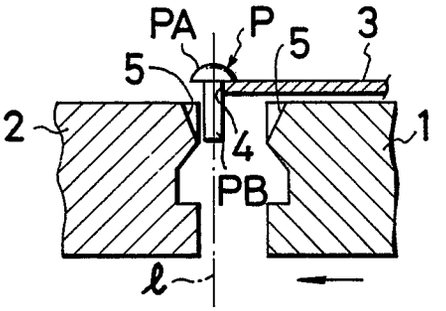


FIG. 2B

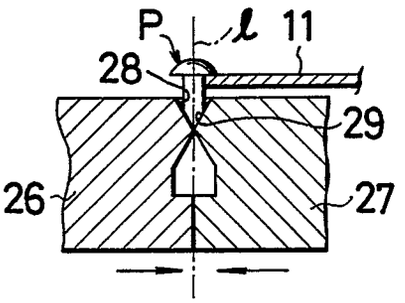


FIG. 3B
PRIOR ART

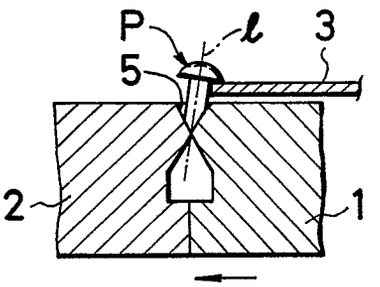


FIG. 2C

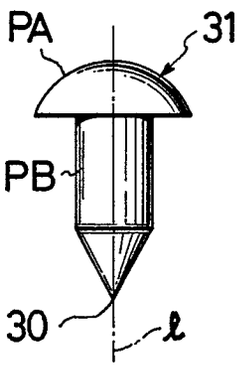


FIG. 3C
PRIOR PROBLEM