May 12, 1936. E. TIMMERBEIL 2,040,576

TOOL FOR JOINING THE ENDS OF IRON BANDS

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Fig. 1

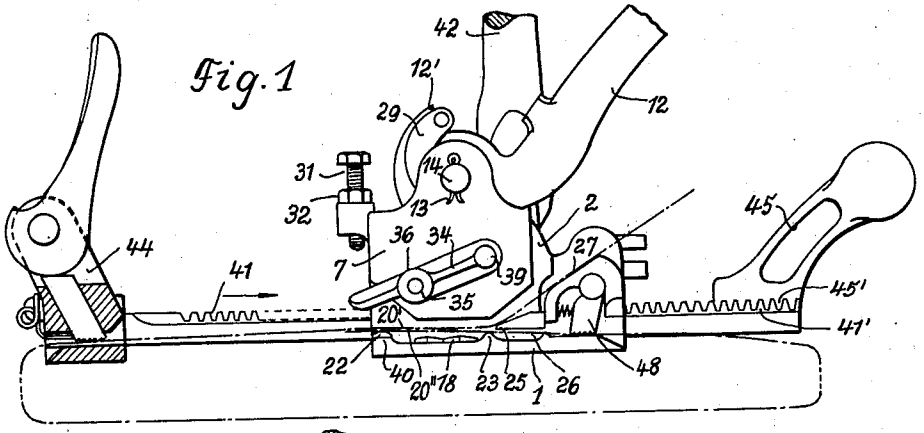


Fig. 2

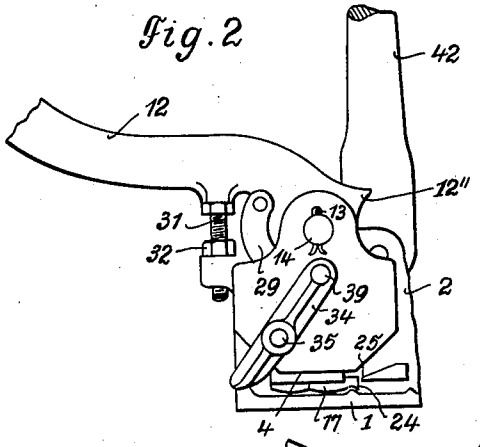


Fig. 3

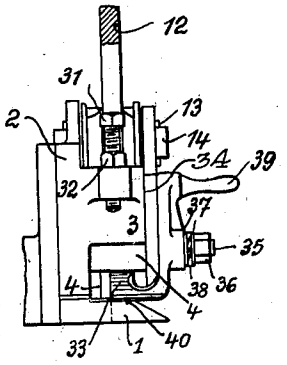
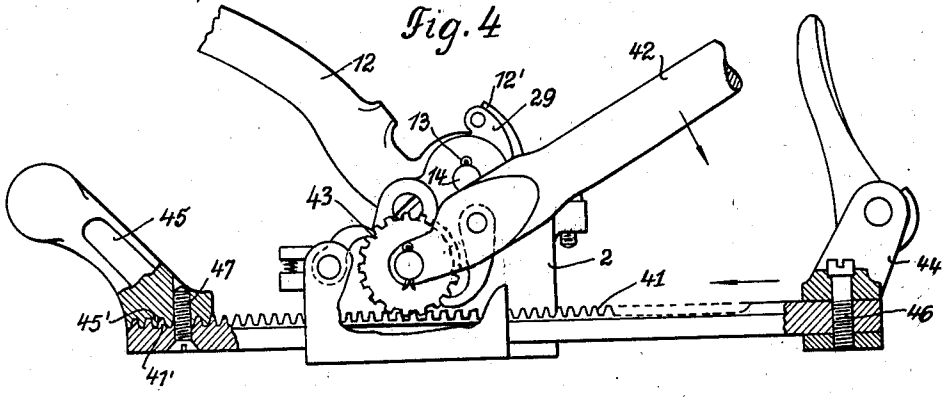


Fig. 4



INVENTOR
Erich Timmerbeil
by S. Sokal.
Attorney.

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TOOL FOR JOINING THE ENDS OF IRON BANDS

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Fig. 5

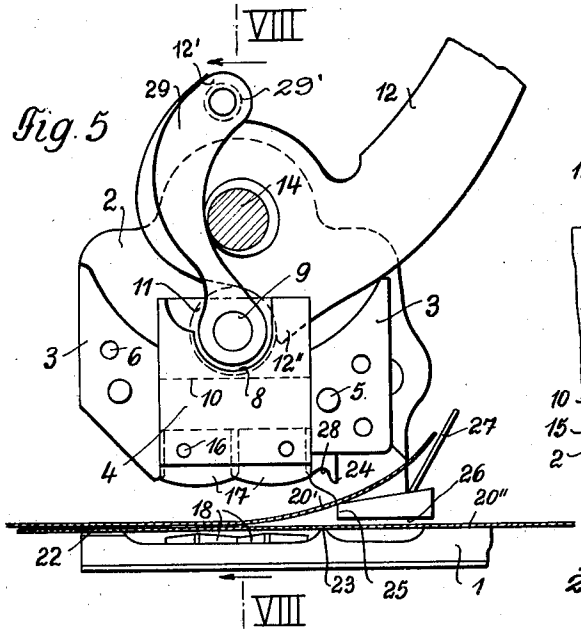


Fig. 8

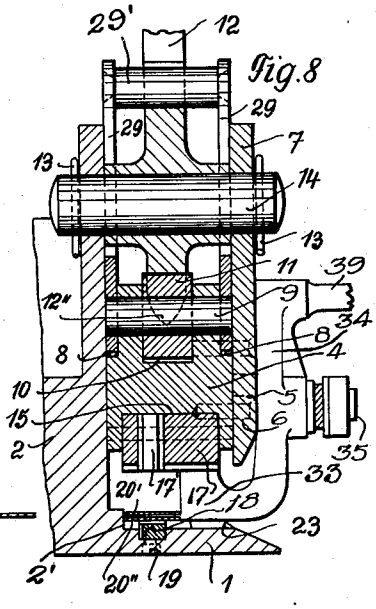


Fig. 6

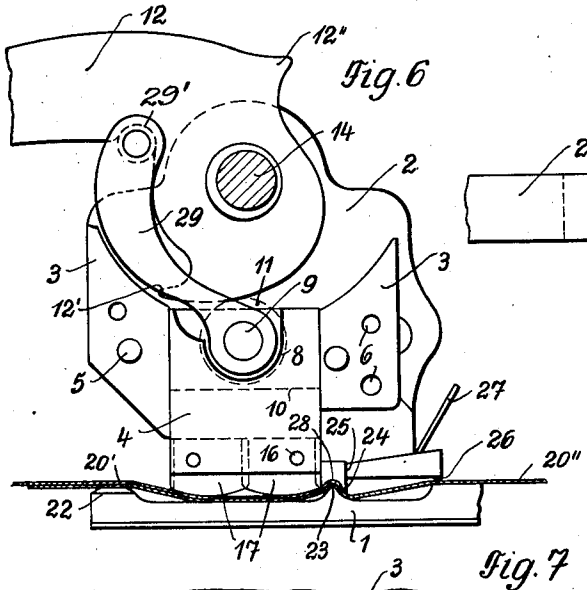


Fig. 7

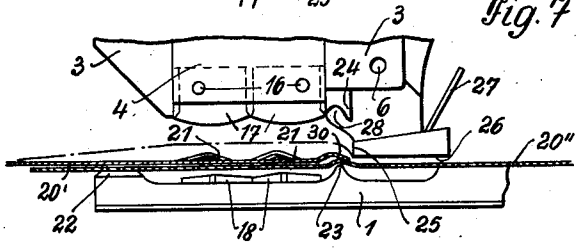


Fig. 9

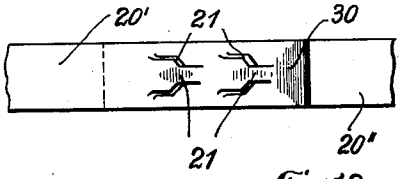
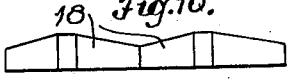


Fig. 10.



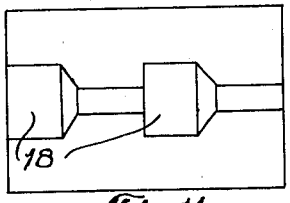


Fig. 11.

INVENTOR

Erich Timmerbeil

by S. Sokal,

Attorney.

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UNITED STATES PATENT OFFICE

2,040,576

TOOL FOR JOINING THE ENDS OF IRON BANDS

Erich Timmerbeil, Schwelm in Westphalia, Germany

Application October 16, 1933, Serial No. 693,842
In Germany January 6, 1933

9 Claims. (Cl. 81—9.1)

I have filed applications in Germany on the 6th January, 1933 and 29th August, 1933.

The invention relates to a method of and a tool for joining the ends of iron bands, of the kind wherein the band ends laid one over the other are provided with pairs of zig-zag shaped slits which are pressed out of the plane of the bands and caused to engage in one another, as illustrated in the British patent specification No. 267,160 dated October 27, 1927 or German 472,334 dated February 27, 1929.

In the known tools for joining hoop ends of the above kind, the slit portions after being stamped out of the band have the tendency to become jammed in the stationary lower dies of the tool. Consequently the slit portions must be subsequently separated from the dies by means of separate auxiliary tools which are inserted under the lower band and serve for lifting the band from the lower die. The known methods are therefore rather complicated and wearisome and consequently the results obtained with the known tools are not very satisfactory.

It has been proposed to arrange on both sides of and adjacent to the stationary lower dies mounted upon the base of the tool, two upwardly projecting ribs, whereby the superposed band portions in which the slits are to be produced, are upon the descent of the movable upper die, moved out of the general plane of the bands, and a force component directed transversely to the plane of the band is produced, said force component tending to return the superposed band ends into the plane of the tensioned band. Experience shows, however, that this transverse force component is not as a rule sufficient to overcome the force holding the jammed-in portions of the superposed bands, and remove these superposed portions from the cavities of the lower dies. This is due to the fact that the superposed band portions in which the slits are produced, are during their bending out of the plane of the band and the closing of the die already under the influence of the tension of the band.

According to the invention this drawback is obviated by the fact that two band tensioning members are arranged one at each side of the dies, at least one of said tensioning members being adapted to execute a tensioning movement in the direction towards said dies and that an upwardly projecting rib is arranged on each end of the casing and adjacent to the stationary dies, the tops of the said ribs being located in a plane above the plane of the tops of the stationary dies. By this arrangement the joining takes place suddenly, after the release of the tensioning devices. This sudden transmission of the tension to the portion at which the joining takes place, suffices to overcome the force of friction holding the band portions firmly jammed in the lower die, even if the jamming has been of an exceptionally firm kind, and consequently the band will always be returned to the original tensioned position and the portion of the band at which the joining takes place will be reliably removed from the dies. The tool working in accordance with the improved method therefore enables a much quicker operation to be effected and consequently its use will also result in a considerably increased output.

On pressing the band ends out of the tensioned position, the free end of the upper band adjacent to the point at which the joining takes place, has the tendency to rise up from the lower band portion, this tendency being due to the bending operation. This rising of the upper band end would impede the proper carrying out of the joining operation, and the invention therefore provides means for imparting to the two superposed band portions an additional crease, preferably during the stamping out of the slit portions, close anterior to the end of the upper band. By this means the upper band end is, notwithstanding the undulating bending thereof, firmly held down upon its length projecting beyond the point at which the joining takes place, so that the free edge of the upper band end cannot, as in the case of known tools, cause any injury to persons handling the package or cause damage to any articles placed upon the package.

In this construction of the tool, the band is, on making the slit portions, pressed down into the stationary lower die, and at the same time the point at which the joining takes place is deflected from the stretched position, and is so stretched that it has the tendency to return into its original stretched condition, upon the return of the upper movable die. Should the additional tensioning of the band produced by the deflection of the band from its original stretched position not be sufficient to remove the band from the lower die after the stamping operation, an absolutely reliable pulling of the portion at which the joining takes place out of the die will be effected, on releasing the tensioning members which serve for tensioning the band, and thereby causing the main band tension to act upon the point at which the joining takes place, as this will result in the production of an instantaneously acting transverse force which will remove the

joint portions of the band with a jerk and rapidly from the dies. Upon the tension of the band being transmitted to the joint, that is, the point at which the joining takes place, the band will be returned into the original stretched position and at the same time the zig-zag shaped slits will engage in one another.

It may be pointed out that the imparting of the additional crease just in front of the end of the upper band is of particular importance. If the upper band end where not held in firm contact with the lower band upon its portion projecting beyond the point at which the joining takes place, proper inter-engagement of the zig-zag shaped slits could not take place.

The force tending to move the point at which the joining takes place from the dies could be produced even without any particular additional means and without any substantial modification of the known tools, by stamping the slits substantially only towards one, that is, the upper side, and this can be attained by providing the movable die exclusively or to a predominant extent with cavities and by accordingly providing the stationary lower die exclusively with projecting die surfaces, which latter upon closing of the die, engage the cavities of the movable die. In that case the slits pressed out of the plane of the band will become jammed in the cavities of the upper die and consequently will, upon the return, that is, upon the upward movement of the upper die, be pulled upwards at the point at which the joining takes place, and this movement will be carried so far until the tension produced by the transverse movement of the band pulls out the slit portions from the movable die. In that case, removal of the band from the die will take place even before the main band tension is transmitted to the point at which the joining takes place, that is, before the tensioning members are opened.

Although either of the two above mentioned methods is by itself sufficient for obtaining the aimed at improvement in the working method of the tool, it is preferred to combine both methods or features in the same tool, in order to make its mode of operation still more reliable and effective. In order to prevent the band ends resting upon the female dies and the ribs of the base plate from sliding laterally out of the tool before the descent of the stamp or from moving relatively to each other transversely to the longitudinal direction of the band, the tool is, according to the invention, provided with a locking bolt which is slid in front of the front edges of the band ends inserted into the tool and holds the band ends in their required position upon the die plate. This locking bolt holds the two ends of the package or hoop to be joined firmly in the required position under the stamp and prevents absolutely any displacement of the properly inserted band ends. The locking bolt is adapted to be moved out of engagement with the band ends and therefore does not in any way hinder manipulation of the tool. With the locking bolt moved out of its operative position, the band ends can be easily inserted into the tool and vice versa, the tool may be laterally removed from the completed hoop in a lateral direction.

In a particularly simple and suitable arrangement and construction of the locking bolt, a freely turnable lever is provided upon the front cover plate of the casing of the tool so as to move with slight friction. The lower end of the lever has a rearwardly projecting portion which forms a lateral stop for the two band ends. The lever can be easily manipulated by a forwardly projecting knob. The die plate is preferably recessed upon the surface co-operating with the depressed locking bolt. By this construction any danger of jamming one or both band ends between the stop and the die plate is reduced. If the band ends are not properly inserted into the tool, the operator is bound to notice it immediately on depressing the bolt.

The accompanying drawings show by way of example one construction of tool adapted for carrying out the improved method, said tool having both the improved reverse arrangement of the dies and ribs for holding the band ends in a raised position, also the improved locking bolt.

Fig. 1 is a front elevation of the tool with the locking bolt in the raised or inoperative position and the die lever in its turned back position.

Fig. 2 is a front elevation of the stamping tool proper in the working position of the parts, that is, with the locking bolt depressed and the die lever at the end of its working stroke.

Fig. 3 is a left hand end view of the tool shown in Fig. 2.

Fig. 4 is a rear elevation of the complete tool, partly in section.

Fig. 5 is a front elevation of the stamping tool with the front casing plate removed with the parts in the position they assume before the actual stamping operation.

Figs. 6 and 7 are similar front views of the stamping tool but showing the parts in different positions, namely, Fig. 6 at the end of the stamping stroke, and Fig. 7 after the completion of the stamping stroke, Fig. 7 showing only the lower portion of the tool.

Fig. 8 is a cross section on line VIII—VIII of Fig. 5 seen from the right and with the locking bolt omitted.

Fig. 9 shows a completed joint in top view.

Figs. 10 and 11 show zig-zag shaped die bases in elevation and plan.

In the illustrated constructional example of the tool 1 designates a base plate beveled at its front edge and 2 a casing resting thereon, which contain the tensioning and stamping means and the appertaining operating levers. The casing 2 is provided upon its front face with two spaced bearing and guide members 3 between the adjacent faces of which is vertically guided a prismatic die block or carrier 4, hereinafter called the stamp. The stamp 4 is guided upon its front and rear sides between the suitably machined front face of the casing standard 2 and the suitably machined rear face of a cover plate 7 fixed to the casing standard 2 by means of two pins 5 carried by the guide blocks 3, 3 and by means of countersunk screws 6. The cover plate 7 may therefore after removal of the screws 6 be easily detached. The stamp 4 is guided with a minimum of friction between the guide blocks 3, the standard 2 and the cover plate 7.

A U-shaped link is turnably mounted in the upper portion of the stamp 4 by means of a bolt 9 (Figs. 5, 6 and 8), the ends of the limbs of the link lying in recesses in the sides of the stamp. The bolt 9 carries upon its middle portion a freely rotatable cylindrical roller 11 which is located in a recess 10 of the stamp.

The stamp 4 is operated, that is, moved up and down, by means of a hand lever 12 only the lower portion of which is shown in the drawings. The lever is turnably mounted upon a pivot bolt 14 supported in the casing standard 2 and in the

cover plate 7 and secured against axial displacement by means of pins 13 (Fig. 8). On turning the lever 12 upwards a projection or nose 12' provided upon the underside of the lever 12 engages the cross member 29' of the yoke-shaped link 29 and thereby pulls the stamp 4 upwards until a second projection or nose 12'' of the lever comes into contact with the roller 11, whereby further upward movement of the hand lever and the stamp is stopped. During the opposite movement of the stamp operating lever 12, from the position shown in Fig. 5 into the position shown in Fig. 6, the cam shaped portion of the lever acting upon roller 11 depresses the stamp 4 until a stop projection provided upon the under side of the lever encounters a fixed stop constituted by an adjustable setscrew 31 mounted in the casing. The setscrew 31 may be fixed in any adjusted position by means of a lock nut 32 and serves for exactly adjusting the working stroke of the stamp operating lever 12, and consequently the depth of the working stroke of the stamp 4, in accordance with the thickness of the band ends to be fastened together.

The underside of the stamp 4 is provided with a recess 15 within which is fixed by means of two rivets 16, 16 a die 17 for co-operation with a counter die 18 mounted upon the base plate 1. According to the invention the dies 17, 18 are so arranged that the female die 17 is fixed to the movable stamp 4 and has two die cavities 17', 17' with zig-zag shaped base, whilst the counter male die fixed to the base plate 1 by means of screws 19 has corresponding projections 18. By depressing the stamp 4 with the female die 17, the band ends 20', 20'' inserted between the stamp and the base plate are provided in known manner with corresponding slits 21, the slit portions projecting in the present construction upwards from the plane of the bands (see Figs. 7 and 8). During the upward movement of the stamp 4, the band 20', 20'' is carried upwards to the position indicated by chain dotted lines in Fig. 7 and is, at the same time, so tensioned that during the further return movement of the stamp 4, the slit portions 20', 20'' are pulled out of the dies, whereupon the slit portions of the two band ends 20', 20'' slide into one another after loosening of the clamping jaws of the tensioning device so that the tool may now be pulled laterally from the band ends which are now firmly secured together.

For further facilitating the automatic removal of the slit band portions from the dies, further means are provided according to the invention, namely ribs 22, 23 which are arranged upon the base plate 1 on both sides of the die 18. These ribs extend transversely to the longitudinal direction of the band and project upwardly.

Upon these ribs rest the two iron band ends 20', 20'' to be joined. Both ribs 22, 23 must project sufficiently high above the adjacent male dies 18 so that after the fastening has been effected, the double band will be removed by its own tension from the projections of the male dies 18, and be held at such raised position as to enable the tool to be readily removed from the firmly fastened portion of the hoop or like article. For the purpose of facilitating insertion of the two band ends into the tool, the two ribs 22, 23 are in a similar manner as the base plate of the tool, provided at the front with beveled edge portions.

In the illustrated construction automatic removal of the projecting slit portions 21 from the female dies is assured by the reverse arrangement of the die portions. Nevertheless, even with this reverse arrangement of the die portions, the provision of the ribs 22, 23 holding the band in a raised position has proved advantageous, as it greatly facilitates the removal of the band over the projections of the male dies mounted upon the base plate. It may be pointed out that with either of the two suggested arrangements alone, the aimed at advantageous mode of operation of the tool could be attained.

An automatic removal of the band from the dies will be attained with the new tool by the mere employment of the ribs, that is, even if the lower dies are female dies. The operation of the removal of the band then takes place as follows:—

After the tensioning members 44, 48 have been moved towards each other by the actuation of the tensioning device consisting substantially of lever 42 and toothed rack 41, and a band placed around a box or package has been tightened by the tensioning members, the fastening device is brought into operation by means of the lever 12. Upon the stamp 4 descending for making the slits 21, the portion of the doubled band 20', 20'' constituting the fastening, is pressed downwardly out of the plane of the band and is thereby bent. Before the bending, the band is quite slack, that is, without tension at the point of joining. The real tension of the band is transmitted to the point of joining only when the two band ends are being joined together and the tensioning members 44, 48 are released. By the bending of the band during the formation of the fastening, however, an additional tension is produced even before the tensioning members 44, 48 are released and the real tension of the band is transmitted to the point of joining, and this additional tensioning tends to remove the deformation of the band, that is, it tends to straighten the band. This arrangement therefore makes it possible for the band to be returned after the removal of the stamp 4, to its stretched condition by the additional tension produced, and to be removed at the same time from the lower dies. If, however, the additional band tension produced by the bending or deflecting of the band from its original plane, is not sufficient to remove the band from the dies, an absolutely reliable removal of the fastened portion from the female dies will occur when the tensioning members 44, 48 serving for tensioning the band, are released, and the main band tension is allowed to act upon the point at which the joining took place, inasmuch as this main band tension will come suddenly into action and will therefore act upon the band instantly after the manner of a sudden blow. Simultaneously with the return of the band into the stretched position, the zig-zag shaped slits of the two band ends will engage each other.

The rib 23 adjacent to the free end of the band 20' inserted into the tool, is steeper than the rib 22 and it has the additional function of producing in the double band 20', 20'' close anterior to the end of the upper band 20' an additional crease or kink 30 for the purpose of causing the portion of the upper band 20' lying on the right of the slit portions in Fig. 9, to bear firmly against the corresponding portion of the lower band 20''.

The rib 23 co-operates with an auxiliary die consisting of a groove-shaped recess 28, provided upon the under side of the upper die 17.

This arrangement is particularly important, as on bending the band from its stretched condition, the free end of the upper band adjacent to

the point of joining, has the tendency to follow the sinuous bend imparted to the band, and rise away from the lower band. This rising of the upper band end would, however, detrimentally affect the fastening operation, particularly in the case in which the removal of the band occurs only after the release of the tensioning members, by the main band tension becoming transmitted to the fastening. In that case, the sudden jumping of the band into its stretched position and the engagement of the slits take place simultaneously. By the imparting of the additional crease, the firm bearing of the upper band end upon the lower band is attained, and this insures a reliable engagement of the zig-zag shaped slits of the two band ends, even if the lower dies are constructed as female dies and the removal of the band from the lower dies takes place only after the main band tension has been transmitted to the point of joining by the opening of the tension member, to remove the band with a jerk and instantly from the male dies and to displace simultaneously the two band ends in the longitudinal direction relatively to each other until the slits of the two bands engage each other and prevent further longitudinal relative displacement.

The two band ends to be fastened together, must, in order to be properly engaged by the stamp 4, be so inserted into the tool that their rear longitudinal edges lie against the abutting surface 2' provided for this purpose in the tool, as otherwise the slits would not be produced in the required central position. In order to secure and firmly hold the bands in this position, the invention provides a bolt 33 which prevents the inserted bands from being accidentally displaced after proper insertion.

In the construction shown, the bolt 33 is constituted by a rearward projection of the lower end of a double armed lever 34, said projection having an operative end face located at a distance from the opposite abutment against which the rear longitudinal edges of the band portions lie, corresponding to the width of the band. The double-armed lever 34 is turnably mounted upon a pivot 35 carried by the cover plate 7, and is mounted with a sufficient friction to enable the lever to be held safely in any adjusted position. For this purpose the lever 34 is held upon its pivot pin 35 by means of a nut 36, two ordinary washers 37, 37 and a resilient washer 38 interposed between the washers 37, 37 so that it is pressed with a sufficient frictional force against the cover plate 7. The upper arm of the lever 34 is provided with a manipulating handle 39.

Before inserting the two band ends to be fastened together into the tool, and for removal of the tool from the fastened band ends of a hoop or like article, the lever 34 is so turned as to lift the bolt 33 from the base plate 1, see Fig. 1. After the proper insertion of the band ends into the tool, the bolt is moved by turning the lever 34 from the position shown in Fig. 2 into its operative position and is retained in this position during the stamping operation. As shown in Fig. 3, the bolt 33 rests in its operative position upon a recessed portion 40 of the base plate. Lateral displacement of the bands relatively to the dies 17, 18 is effectively prevented by the bolt, and consequently proper registration with regard to the stamp is attained.

For cutting off the upper band end portion which projects beyond the fastening points, a pair of knives 24, 25 is provided as usual, the knife 24 being fixed to the stamp 4 and being in the construction shown made in one piece with the upper die 17, whilst the counter knife 25 is so mounted in the casing 2 as to leave between the knife 25 and the base plate 1 a slot 26 through which the lower band end which, of course is not to be cut off, passes. In rear of the lower knife 25 an inclined guide surface 27 is provided for a better guiding of the upper band end to be cut off.

The rear portion of the casing standard 2 is, as usual constructed to form the casing for the tensioning device which latter comprises, as usual, a longitudinally guided toothed rack 41 and a ratchet gear 43 operable by means of a lever 42. The toothed rack 41 carries at the end which, during the working stroke, lies at the rear, a tensioning device 44. At the other end of the rack there is provided a hand lever 45 which serves as a grip for sliding back the toothed rack after the completion of the working stroke. The tensioning device 44 as well as the hand lever 45 are connected with the toothed rack by easily detachable means, namely the tensioning device 44 by means of a screw 46 and the lever 45 by means of the screw 47. The end of the toothed rack associated with the tensioning device 44 is smooth, that is, not provided with teeth, and is inserted into a corresponding recess of the tensioning device casing, whilst the hand lever 45 is applied directly to the toothed rack. In order to obtain a secure connection between the hand lever 45 and the toothed rack 41, the toothed rack is provided at the associated end 41' with teeth engaging suitable cone teeth 45' of the base of the lever.

It will be seen that the interengaging teeth 41' and 45' provide a very firm connection between the two parts so that a single easily detachab'e screw 47 is sufficient to hold the parts together. This manner of fixing the lever 45 to the toothed rack can also be used with advantage if the lever is made, as usual, of very light metal.

The improved construction of the toothed rack and the parts fixed thereto, considerably facilitates the assembling of the parts, namely mounting the toothed rack in the casing. In order to insert the toothed rack into the gear 43 of the tensioning device, it is no longer necessary to dismount the driving pinion and remove for this purpose the various parts of the rachet gear 43. The toothed rack can be inserted with its toothed end 41' forthwith, that is, without dismounting any parts, into the casing from one end. The rack 41 can be removed by removing the hand grip 45 so that the rack can be slid without dismounting the pinion. Consequently, it is, with the improved construction, very easy to exchange a toothed rack so that a long toothed rack can be used with easily compressible packages, whilst in connection with boxes or like firm packages, a short toothed rack can be employed. The tensioning device 44 and the hand lever 45 can be very readily fixed to a toothed rack of the required length. This exchangeability of the toothed rack and its easy insertion into the casing make the whole tool readily applicable to various purposes.

The stationary second tensioning device 48 which serves for clamping the lower band end lying in the tool, is as usual, arranged close to the tool.

The tensioning device 48 consists, as shown in Fig. 1, of a one-armed lever which is held by a spring in its operative position, in which the

lower clamping surface bears against the base plate or the inserted band. In order to insert the band under the clamping lever, the lever is swung upwardly against the pressure of the spring. On tensioning the band, clamping is automatically effected owing to the eccentric arrangement of the clamping lever. It is not necessary to loosen the clamping lever after tensioning and closing, as after the release of the other tensioning member **44**, the tension of the band is no longer transmitted to the clamping lever **48**, so that upon removal of the tool, the band is released without any substantial resistance, from the tensioning device **48**.

Assuming that the tool is to be used for tightening a steel band or hoop upon a package and for fastening together the two overlapping ends of the steel band, the operation is as follows:

The steel band is first inserted with the end **20''** into the tool as shown in Fig. 1 and is clamped by means of the clamping device **48** arranged within the tool. The band is then placed around the package and the other end of the band **20'** is inserted through the movable clamping device **44** placed over the previously clamped band end **20''** and between the guide member **27** and the auxiliary die **28**, as shown in Fig. 1 by dotted lines. The band end **20'** is then clamped by means of the device **44**. The ratchet lever **42** is now operated to move the ratchet gear **43** and to shift the toothed rack **41** together with the device **44** to the right in the direction of the arrow, whereby the steel band which is held stationary in the tool by the clamping device **48** is tensioned and made quite tight upon the package. The stamp is then depressed by means of the lever **12** to produce the notches shown in Fig. 9 and moved upwards back into the initial position. The two clamping devices **44** and **48** are then released, and the two superposed band ends are tensioned owing to the tension previously imparted to the external portion of the band lying outside the tool. If the female dies are stationary, the tensioning of the band ends **20'** and **20''** will cause the band ends to be lifted from the matrices. If the female dies are the upper dies the band ends will be removed from the female dies during the upward movement of the stamp.

After the band has been released by the clamping devices **44** and **48** the tool may be removed sideways. It will thus be seen that the removal of the band ends from the female dies can be assisted either by making the female dies movable in the vertical direction and thus producing a tensioning of a portion of the band ends lying in the female dies, or can be assisted in the case of the female dies being stationary by the provision of ribs **22** and **23** which upon release of the clamping devices **48** and **44** or one of these devices, will cause the band ends pressed into the female dies to assume a horizontal position and be removed from the dies.

By combining the two features, namely, making the movable dies the female dies and providing the ribs **22** and **23**, an absolutely reliable action, that is, prompt removal of the acted upon band end portions from the female dies is still further insured.

It will be understood that the invention is not restricted to the construction shown and that various modifications are possible within the scope of the invention.

I claim:

1. A tool for fastening superposed band ends by producing in the superposed band ends pairs of zig-zag slits, comprising in combination: a casing having a base adapted to be slid under the superposed band; die means for producing zig-zag slits comprising dies mounted upon said base to underlie the superposed bands; counter dies movably mounted for co-operation with said stationary dies; means for moving said movable dies vertically up and down; and means for locking the superposed band ends in the required position relatively to said dies, said means comprising a bolt adapted to be moved in front of and to act upon the front edges of the inserted band ends.

2. A tool for fastening superposed band ends by producing in the superposed band ends pairs of zig-zag slits, comprising in combination: a casing having a base adapted to be slid under the superposed band; die means for producing zig-zag slits comprising dies mounted upon said base to underlie the superposed bands; counter dies movably mounted for co-operation with said stationary dies; means for moving said movable dies vertically up and down; a hand operable lever mounted with friction on the tool so as to remain automatically in any adjusted position; and means for locking the superposed band ends in the required position relatively to said dies, said means comprising a bolt adapted to be moved in front of and to act upon the front edges of the inserted band ends, said bolt being carried upon said hand operable lever.

3. A tool for fastening superposed band ends by producing in the superposed band ends pairs of zig-zag slits, comprising in combination: a casing having a base adapted to be slid under the superposed band; die means for producing zig-zag slits comprising dies mounted upon said base to underlie the superposed bands; counter dies movably mounted for co-operation with said stationary dies; means for moving said movable dies vertically up and down; a hand operable lever mounted with friction on the tool so as to remain automatically in any adjusted position; and means for locking the superposed band ends in the required position relatively to the said dies, said means comprising a bolt adapted to be moved in front of and to act upon the front edges of the inserted band ends, said bolt being carried upon said hand-operable lever, said base plate having a recess for the reception of said bolt, substantially as described.

4. A tool for fastening superposed band ends by producing in the superposed band ends pairs of zig-zag slits, comprising in combination: a casing having a base adapted to be slid under the superposed band; die means for producing zig-zag slits comprising dies mounted upon said base to underlie the superposed bands; counter dies movably mounted for co-operation with said stationary dies; means for moving said movable dies vertically up and down; and band tensioning means comprising a pinion, ratchet means for turning said pinion, a toothed rack meshing with said pinion and slidably and exchangeably mounted in said casing, said toothed rack carrying at one end a band clamping device and carrying at the other end a hand grip; said rack being so shaped that on removal of the grip the rack can be slid out without dismounting the pinion, substantially as described.

5. A tool for fastening superposed band ends by producing in the superposed band ends pairs of zig-zag slits, comprising in combination: a casing having a base adapted to be slid under the superposed band; die means for producing zig-zag

slits comprising dies mounted upon said base to underlie the superposed bands; counter dies movably mounted for co-operation with said stationary dies; means for moving said movable dies vertically up and down; and band tensioning means comprising a pinion, ratchet means for turning said pinion, and a toothed rack slidably and exchangeably mounted in said casing, said toothed rack carrying at one end an easily exchangeable clamping device and carrying at the other end an easily exchangeable hand grip, the base of said hand grip having teeth corresponding to and engaging with the teeth of said toothed rack and being connected to the toothed rack by means of a screw.

6. In a tool for fastening superposed band ends, the combination of: a casing, stationary dies mounted on said casing; counter dies movably mounted for co-operation with said stationary dies; means for moving said movable dies vertically up and down; two band tensioning members arranged one at each side of the dies, at least one of said tensioning members being adapted to execute a tensioning movement in the direction towards said dies; and an upwardly projecting rib arranged on each end of the casing and adjacent to the stationary dies, the tops of the said ribs being located in a plane above the plane of the tops of the stationary dies.

7. In a tool for fastening superposed band ends, a combination as specified in claim 6, wherein said movably mounted counter dies are located above said stationary dies and are provided with zig-zag recesses, whilst said lower stationary dies are provided with zig-zag projections, which during the fastening operation engage with the recesses of the counter dies, to press out zig-zag slits in the upward direction only.

8. In a tool for fastening superposed band ends by producing in the superposed band ends pairs of slits such as zig-zag slits, the combination of: a casing; stationary dies mounted on said casing; a stamp comprising counter dies movably mounted above said stationary dies and co-operating therewith, said counter dies being provided with zig-zag recesses, and said stationary dies being provided with zig-zag projections engaging said recesses during the fastening operation and thereby pressing out slits in the band ends in the upward direction only; means for moving said movable dies vertically up and down; two band tensioning members arranged one at each side of the dies; at least one of said tensioning members being adapted to execute a tensioning movement in the direction towards said dies; an upwardly projecting rib arranged at each side of and adjacent to the stationary dies, a cutting device for cutting off the upper superposed band end; and an auxiliary die arranged between said cutting device and said co-operating dies and co-operating with one of the ribs serving for forming a crease in the band ends.

9. In a tool for fastening superposed band ends by producing in the superposed band ends pairs of slits such as zig-zag slits, the combination of: a casing; stationary dies mounted on said casing; a stamp comprising counter dies movably mounted above said stationary dies and co-operating therewith, said counter dies being provided with zig-zag recesses, and said stationary dies being provided with zig-zag projections engaging said recesses during the fastening operation and thereby pressing out slits in the band ends in the upward direction only; means for moving said movable dies vertically up and down; two band tensioning members arranged one at each side of the dies, at least one of said tensioning members being adapted to execute a tensioning movement in the direction towards said dies; an upwardly projecting rib arranged at one side of and adjacent to the stationary dies, a second upwardly projecting rib arranged on the opposite side of and adjacent to the stationary dies; a cutting device for cutting off the upper superposed band end; and an auxiliary die on said movable stamps and arranged between said cutting device and said co-operating dies and constituting a female die member, the second mentioned rib being formed with a sharply inclined flank, and constituting a male die member, the male and female die members co-operating to form a crease in the band.

ERICH TIMMERBEIL.