APPARATUS FOR JOINING THE OVERLAPPING ENDS OF A METAL BAND WRAPPED AROUND A PACKAGE BY MEANS OF A SLEEVELESS JOINT

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This invention relates to an apparatus for joining the overlapping ends of a metal band wrapped around a package by forming a sleeveless joint, particularly for forming a joint by cutting at least one pair of angled slots into the edges on opposite sides of the metal band in such a manner that the interconnecting web between the slots is pressed out of the plane of the band, said apparatus for forming the sleeveless joint comprising several dies of which at least one is movable, said movable die or dies acting on the metal band from the side of the package and cooperating with a die located above the metal band and consisting of two relatively movable members for forming the sleeveless joint.

In an already proposed form of construction of such an apparatus the die located above the metal band consists of two relatively movable members. Between the two movable members there is a gap of adjustably variable width. When the joint is being formed the overall width of the two members is roughly equal to the clear distance between the slots which the apparatus cuts into the metal band. After completion of the joint and when the movable cutting dies have reopened, the two members of the die cease to remain in their separated positions and close towards one another, thereby reducing their overall width and the width of the gap between them. By thus contriving the members of the die above the band it is intended to facilitate withdrawal of the joined parts of the metal band from the apparatus.

It is the object of the present invention to provide an apparatus for joining the overlapping ends of a metal band wrapped around a package by forming a sleeveless joint with which crosswise squeezing of the ends of the band can be performed.

For solving this problem the present invention proposes in substance to make the two relatively movable members movable into closer juxtaposition after the slots have been cut in order to permit the metal band to be transversely squeezed, and to provide them with restoring means for returning said movable members into their former positions when the apparatus is reopened.

The restoring means are preferably a compression spring which urges the relatively movable members of the die apart. Conveniently the compression spring may be contained in oppositely aligning blind holes, one in each of the relatively movable members of the die. In order to prevent the relatively movable members of the die from being separated too far, for instance far enough for the spring to drop out of their holes, abutments are provided and preferably associated with the movable members which operate from underneath the metal band.

The two movable cutting dies of the apparatus may be formed with portions which cooperate with the edges of the metal band, the relative distance between said portions being less than the width of the metal band when the apparatus is in closed position.

The proposed form of construction of the band joining apparatus permits the band to be squeezed together crosswise of the length of the band as desired, and it is easily possible to determine the degree of lateral squeezing which is applied. If it is desired only relatively slightly to squeeze the joined ends of the band, then the cooperating portions of the movable cutting dies need be arranged to close to within a distance which is only slightly less than the width of the band. On the other hand, if a greater degree of squeezing is wanted, then this distance can be arranged to be substantially less.

In view of the described construction of the die operating above the metal band the required squeezing action on the ends of the band can be easily provided, because the relatively movable members of this die readily permit the overall width of the die to be reduced against the resistance of the compression spring interposed between the two members of the die. When the members of the die cease to be subjected to the squeezing pressure the spring can restore the relatively movable members of the upper die to their original positions.

These and other features of the invention will be more particularly described hereinafter.

An embodiment of the invention will now be described by way of example and with reference to the accompanying drawing, in which:

FIG. 1 is an elevational view of a pincher-like joining apparatus as proposed by the present invention in open position, parts of the apparatus being broken away, and FIG. 2 is a view similar to FIG. 1 but showing the apparatus in closed position.

First and foremost it should be understood that in the pincher-type joining or connecting apparatus illustrated in FIGS. 1 and 2 the means for tensioning the band are not shown. These means may be of a construction already known to the art and they need not be associated with the band joining apparatus. In fact the tensioning device and the band joining apparatus may be separate devices.

Since in the majority of cases the fastening of a metal hoop consists of several fastening catches, for example of three catches aligned lengthwise of the band, a jigsaw receiver may be used for the joining apparatus. Conveni-ently the receiver may be subdivided into several regions into which the joining apparatus is consecutively insertable. Alternatively, arrangements may be made for transferring the joining apparatus automatically into the required region of the receiver.

The joining apparatus illustrated in the drawing comprises positively lever-controlled working parts. All the components of the apparatus which will be hereinafter described are mounted on a common frame 70. They are all movably mounted with the exception of a grip 72 which is firmly attached to the frame 70, and which substantially serves for conveniently holding and steadying the frame 70 in use. The grip 72 which of only part is shown consists of a tubular member securely attached to the frame 70, for instance by welding. At the base of the grip 72 the frame 70 is fitted with a fixed abutment 74 with a concave face at its upwardly directed end. This concavity serves as a rest for the reception of an operating lever 73 and as an abutment for limiting its deflectability.

The operating lever 73 which consists of a tube is adapted to receive the shaft end 75 of a pivot head 76. The shaft end 75 and the pivot head 76 are secured against axial displacement by means of a pin 77. The pivot head 76 is rotatably mounted on a pivot pin 78 affixed to the frame 70. Moreover, a radially widened portion of the pivot head 76 is linked to two levers 79 and 80, each lever being hinged on a pin 81. In order to permit the apparatus to be opened as illustrated in FIG. 1, the lever 80 is arched in the manner of a bellcrank. This enables the upper end of the upwardly retracted lever 79 to be pulled into the space made available by the crook of the crank. The bottom ends of the two levers 79 and 80 are hingely connected to two symmetrically placed and pivoted
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3 levers 82. The hinges between the levers 82 and the associated levers 79 and 80 are formed by pins 83. The movable levers 82 of the apparatus which serve for de-

forming the metal band cooperate in the manner of jaws. They each have the form of a double-armed lever pivot-

ately mounted on the frame 70. When opened (FIG. 1) they form a mouth between them for the insertion there-

into of the metal band. The pivot of each of the levers 82 on the frame 70 is formed by a pin 84, the hinges between these double-armed levers 82 and their associated levers 79 and 80 being established by the above mentioned pins 83. The resultant flanks of the levers 82 and 84 are so chosen that the levers can be deflected in the manner

required. For forming the joint between the ends of the metal band which is not shown in the drawing both double-

armed levers 82 are provided with a reentrant recess 85. The lengths of the flanks of each recess 85 differ and their purpose will be later described in greater detail. For trans-

ferring the metal band to a suitable level at which it can be gripped by the jaws of the levers 82, merely a back re-

stamping or spacing member is provided. However, for this purpose use may be made of parts of the tool which are in a short distance clear of the package and thus present it correctly to the jaws or recesses 85 of the joining apparatus.

A die which is indicated generally by the numeral 71 comprises two members 71' and 71". These two members 71' and 71" are pivotally mounted on a common pin 191 secured to the frame 70. In shape, construction and man-

ner of mounting the die 71 is comparable to a known scribing compass with its legs cut off short at the same level so that the ends of the stamps of the legs define a common lower end face. In the drawing this lower end face is designated by the numeral 86. The two stamps 71' and 71" can be splayed apart. They are urged apart by a compression spring 190 which is contained in two oppositely aligning blind holes, one in each of the two stamps 71' and 71". Moreover, the sides of the stamps 71' and 71" which face away from each other are formed with recesses 89. These recesses are arcuately curved, and the radius of curvature coincides with the arcuately curved portion of the double-armed lever 82 situated on the side of and adjacent the arcuate recess 89.

The resultant joint is an angled slot joint of a kind known to the art, which holds the overlapping ends of a metal band safely together. For producing this joint the die 71 and each of the double-armed levers 82 at the end cooperating with the die 71 forms a reentrant angle. The lower flank 86 of this recess has a bevel edge having a favourable cutting angle for producing the slot. This lower flank 86 cooperates with the recess 89 in the cooperating member of the die 71' or 71". The upper flank 87 of the jaw-like recess has no cutting action to perform in producing the slot. It has other purposes in-

stead thereof. The blunt point 193 at the leading end first bears against one edge of the arcuate recess 89 of the die 71. The upper flank 87 of the jaw thus prevents the two relatively movable members 71' and 71" of the die from being thrust apart by compression spring 190 within the entire angular operating range of the two double-armed levers, so that the overall width of the combined lower end faces 88 will always be the most favourable for the formation of the slot. As will be understood more par-

ticularly by reference to FIG. 1 (apparatus in open posi-
tion) the flanks 87 of the upper flank of the metal band from the die 71 after the joint has been formed. It will be clear from a consideration of FIG. 2 that during the formation of the joint the metal band is drawn a short way over the die 71. It would therefore be difficult to remove the band which in this region is in two sections 71' and 71". In this case the die is taken apart and the flanks 87 of the jaws strip the metal band from the die 71 when the apparatus is re-

opened. Finally, the upper flank 87 of the jaw performs

the task of squeezing the joint between the bands together after the slots have been formed and thus ensures that the joint cannot undo after it has been formed. In order to produce this squeezing effect the reentrant end of the flank 87 of the jaw adjacent the other flank 86 merges into an angular portion 82 which has the reentrant apex of the recess. Consequently the metal band, after having been notched, is squeezed together during the final phase of the closing action by the two opposed acting regions 192 of the upper flanks of the jaws 87. The squeezing action affects the edges of the band roughly at the level of the angled slots. The edges are cut towards the central web of the joint. The slot edges which project perpendicularly from the surface of the metal band are thereby not merely forced into tight contact but the edges are also urged partly to overlap into the gap created by the formation of the slot. The squeezing action can proceed without difficulty because the two members 71' and 71" of the die 71 can yield to reduce the overall width of the die. Nevertheless, the stripping of the band from the die 71 takes place reliably despite the fact that the edges have been squeezed as described.

The kinematical function of the joining apparatus will be described again as revealed by FIGS. 1 and 2. When the apparatus is open as in FIG. 1, the operating lever 73 is raised perpendicularly to the general plane of the base. The pivots 81 of the levers 79 and 80 are situated on one side of the pivot pin 78 slightly out of vertical alignment. The two double-armed levers 82 are thus pulled upwards and extend at an angle to the plane of the base. The space between their two free ends is sufficiently wide to permit the metal band to enter between them. For forming the joint the operating lever 73 is pulled downwards towards the grip 72 until it strikes the top of the abutment 74. In the course of this movement the pivot head 76 revolves clockwise, causing the two pivots 81 to descend towards the two pivot pins 84. The distances between the pins 81 and the pins 84 are thus reduced or, expressed in other words, the angles between the two levers 82 and the levers 79 and 80 become more acute, resulting in relatively op-

posed depression of the levers 82 into a substantially hori-

zontal position. The cooperation of the levers 82 thus forms the required joint in conjunction with the die 71 as already explained.

As already mentioned, the described form of construc-

tion is merely illustrative and is not intended to limit the scope of the invention. Many modifications and variations can be devised. For instance, the restoring means for the two relatively movable members of the die may differ from those shown in the drawing. For instance,cams might be used for the purpose.

I claim: 1. Apparatus for fastening overlapping ends of a metal strip wrapped around a package by means of at least one fastening catch comprising, in combination, a frame; a pair of first die means pivotally mounted spaced from each other on said frame and having each a first strip engaging facilitating surface adapted to engage the overlapping ends of the strip on one face thereof and a second strip engaging face portion adapted to engage a respective side edge of the overlapping strip ends; third die means carried by said frame and arranged substantially between said pair of first die means, said third die means comprising two die mem-

bers having end faces located substantially in one plane and adapted to engage said overlapping end on said face thereof and said overlapping end faces spaced from said third die means a distance smaller than the width of said strip; biasing means cooperating with said die members and biased to yieldably maintain the latter in said first spread apart position; and
means carried by said frame and cooperating with said die means for moving the latter relative to each other in such a manner that said strip engaging face portions of said first die means move beyond said end faces of said third die means so that the latter forms two slits through said overlapping strip ends extending substantially in longitudinal direction of said strip ends spaced from longitudinal edges thereof and presses out webs between said slits and so that said second strip engaging face portions of said pair of first die means are moved toward each other to press the longitudinal edges of said overlapping strip ends, after the slits have been formed therethrough, toward each other, moving thereby said two die members from said first spread apart position to said second position.

2. Apparatus as defined in claim 1, wherein said biasing means is in the form of a compression spring.

3. Apparatus as defined in claim 2, wherein said die members overlap each other at the ends thereof distant from said end faces and are pivotably mounted on said frame at said overlapping ends.

4. Apparatus as defined in claim 3, wherein each of said die members is formed between its ends with a blind bore facing the blind bore of the other die member and wherein opposite ends of said compression spring are respectively located in the blind bores formed in said die members.

5. Apparatus as defined in claim 1, wherein said pair of first said die means engage said die members of said third die means to limit spreading of said die members beyond said first spread position under the influence of said biasing means.

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