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

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FIG.1

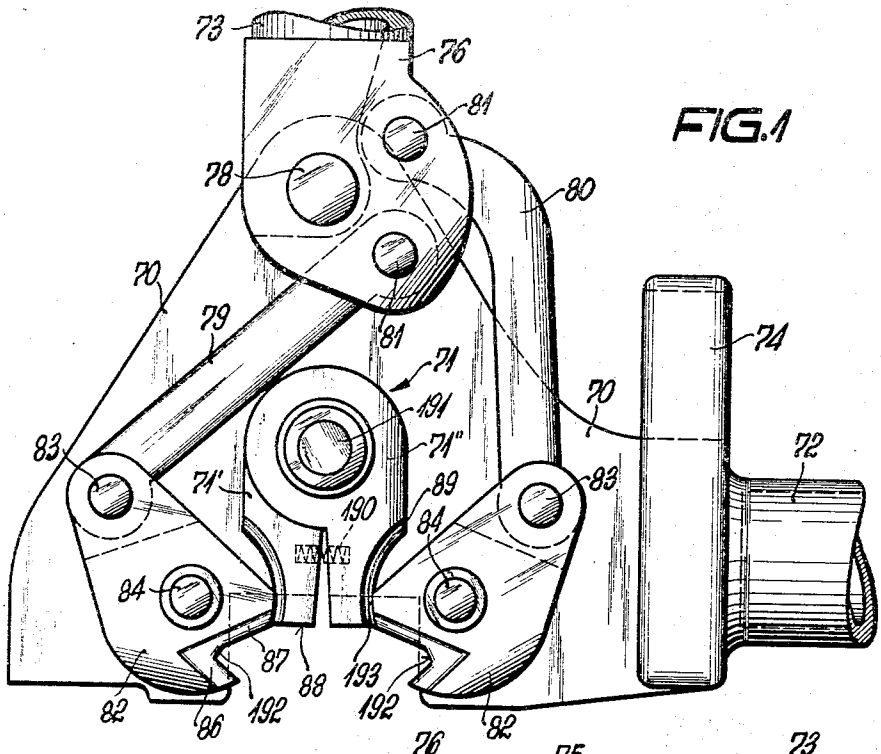
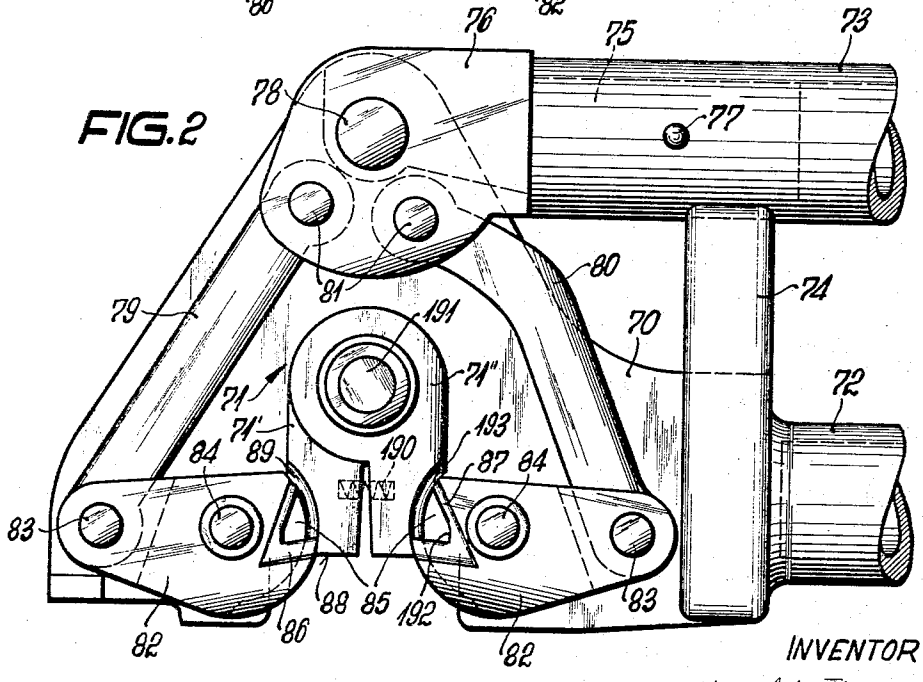



FIG.2

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

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5 Claims. (Cl. 140—93.2)

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 dies 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 former 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 pincer-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 pincer-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 jig-like receiver may be used for the joining apparatus. Conveniently 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 hereafter 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** of which 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 formed 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 hingeably connected to two symmetrically placed and pivoted

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 deforming the metal band cooperate in the manner of jaws. They each have the form of a double-armed lever pivotably mounted on the frame **70**. When open (FIG. 1) they form a mouth between them for the insertion thereinto 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 relative positions of the pins **83** 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 transferring the metal band to a suitable level at which it can be gripped by the jaws of the levers **82**, merely a back rest or spacing member is provided. However, for this purpose use may be made of parts of a tensioning tool, which pull the band 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 pivotably mounted on a common pin **191** secured to the frame **70**. In shape, construction and manner 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 stumps of the legs define a common lower end face. In the drawing this lower end face is designated by the numeral **88**. The two stumps **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 stumps **71'** and **71''**. Moreover, the sides of the stumps **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 the slots the recess **85** provided in 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 instead 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 particularly by reference to FIG. 1 (apparatus in open position) the upper flanks **87** of the jaws also serve for stripping 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 steel 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 layers from the die **71**. In order to overcome this difficulty the two upper flanks **87** of the jaws strip the metal band from the die **71** when the apparatus is reopened. 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 **92** across 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 pressed 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 kinematics 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** swivels 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 opposed deflection of the levers **82** into a substantially horizontal 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 construction is merely illustrative and is not intended to limit the scope of the invention in any way. Various modifications 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 face portion 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 members having end faces located substantially in one plane and adapted to engage said overlapping strip ends on a face thereof opposite said one face, said two die members being mounted on said frame movable relative to each other between a first spread position and a second position, adjacent side edges of said end faces are spaced in said first spread position farther apart than in said second position and the other side edges of said end faces are spaced from each other in said first spread position 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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