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Back et al.

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[54] **SEALING TONGS**

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[52] **U.S. Cl.** **140/93.4**

[51] **Int. Cl.** **B21f 9/02**

[58] **Field of Search** 140/93.4; 100/30

[56] **References Cited**

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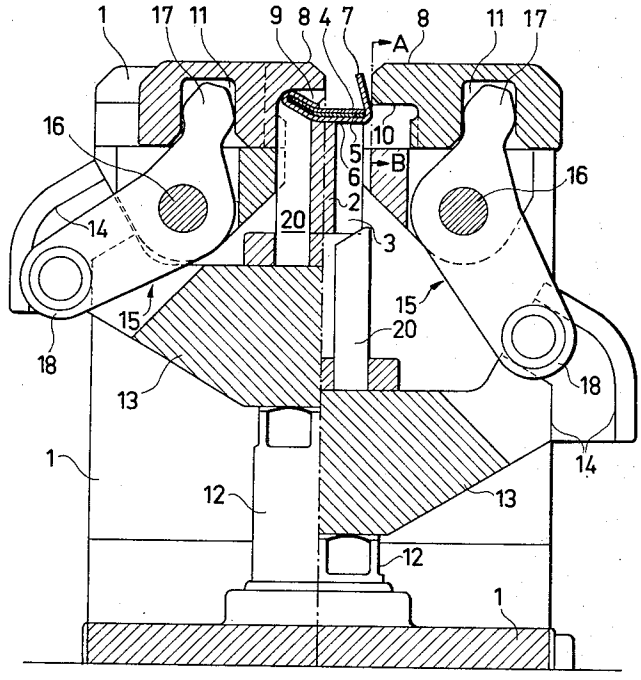
[57] **ABSTRACT**

Sealing tongs for attaching the ends of a metallic or non-metallic strap to each other with a strap seal manufactured from a plate-like blank have having a base portion on a frame structure; at least two jaw means fitted to the frame structure and adapted for slidable movement transversally in relation to the strap and linearly towards and away from each other on the same plane to bend the collars of the strap seal blank against the strap as the jaw means approach each other; those surfaces of the jaw means which come against the collars being provided with several spaced notches in the longitudinal direction of the strap; several punches on the same level as the ends to be joined or on the opposite side of the base in relation to the ends, and adapted to be moved towards and away from the strap seal for corrugating and/or punching the strap ends and the strap seal parts surrounding them, when the punches are pressed into the notches in the jaw parts from both sides of the base or through the notches in the base; and means fitted to the frame structure for guiding the jaw parts and the punches and for actuating the same synchronically in relation to each other so that the punches corrugate and/or punch the strap seal essentially only when the jaw parts are closest to each other.

6 Claims, 4 Drawing Figures



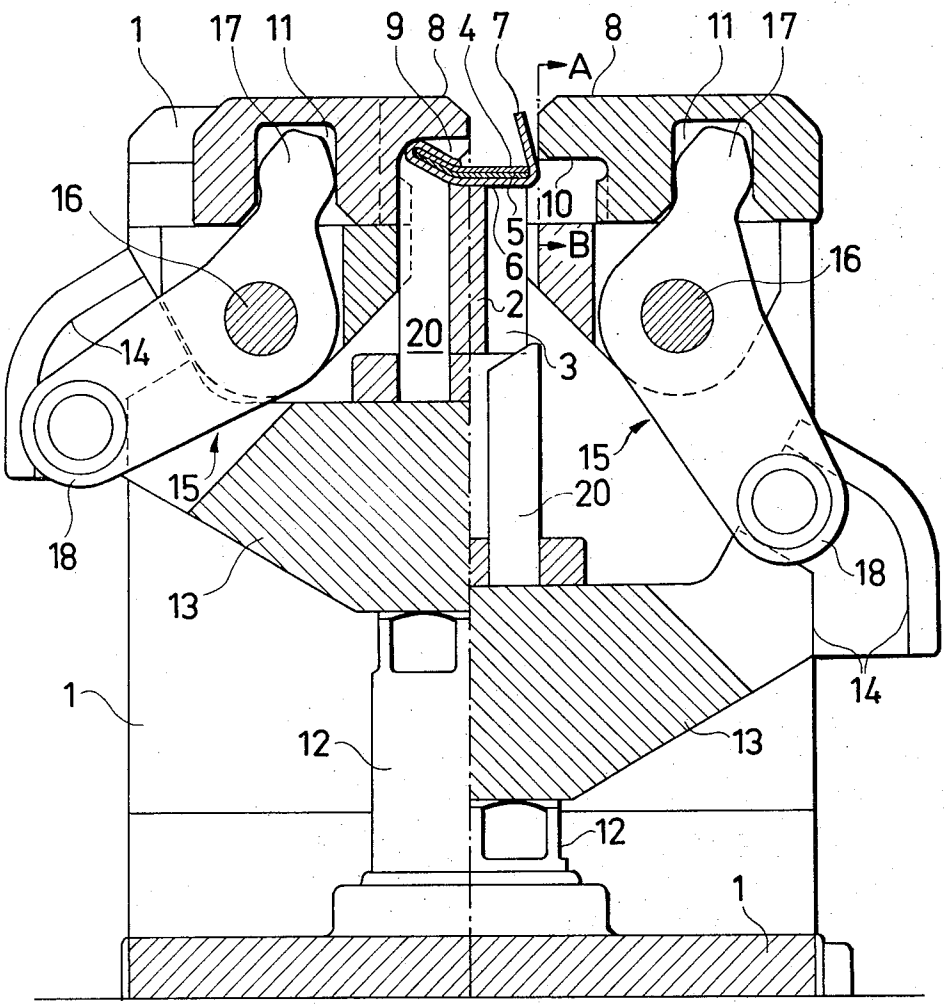

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Fig. 1

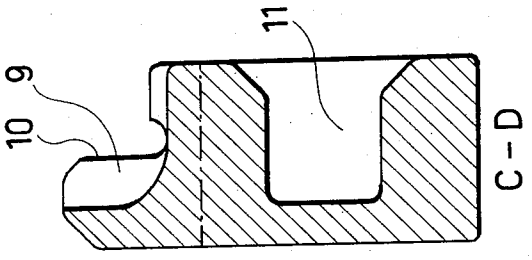

Fig.4

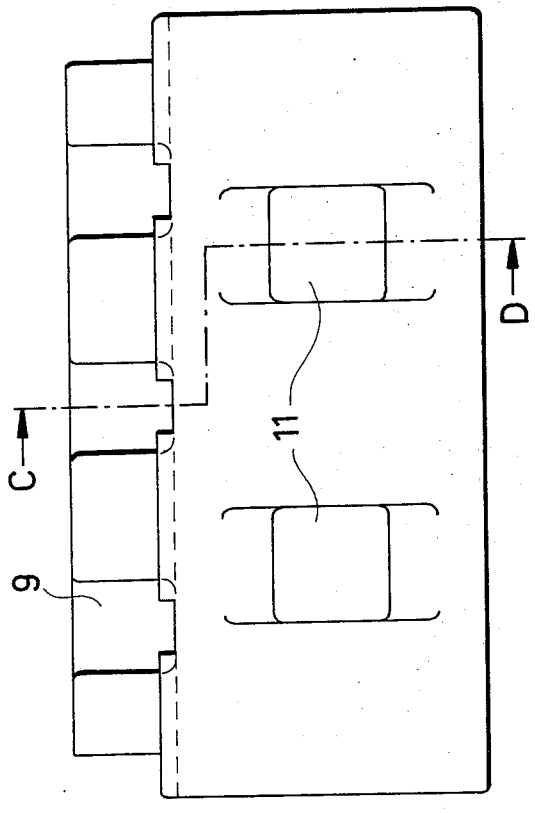

Fig.3

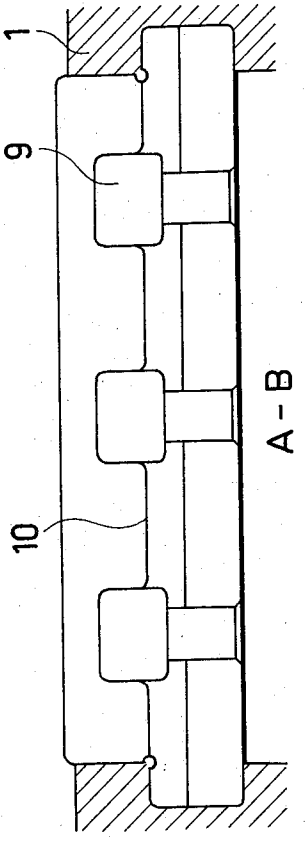

Fig.2

SEALING TONGS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to sealing tongs for attaching the ends of a metallic or non-metallic strap, e.g. a strap iron, to each other with a platelike strap seal.

2. Description of the Prior Art

Sealing tongs of various designs are known previously. Usually these known sealing tongs are provided with jaws which are situated on opposite sides of a base, which can be pivoted around a shaft parallel to the strap iron, and which, while being closed, turn against the upward-directed collars of the strap seal blank and force them towards the strap iron and the base. In this case, the jaws are advantageously provided with spaced protuberances or blades in the longitudinal direction of the steel band. These protuberances or blades press against the strap seal to pierce, cut or corrugate this part. Alternately the solid base can work as a punch if it has protuberances.

Also known are sealing tongs with one stationary jaw and one jaw which can be moved linearly towards and away from the former, essentially on the same plane as the base. Using these sealing tongs does not require as much strength as using sealing tongs with a turning movement of the jaws.

The object of the present invention is to create improved sealing tongs for attaching the ends of a strap iron to each other securely.

SUMMARY OF THE INVENTION

The sealing tongs according to the invention comprise a combination of at least two jaw means fitted to the frame structure and adapted for slidable movement transversely in relation to the strap and linearly towards and away from each other on the same plane to bend the collars of the strap seal blank against the strap as the jaw means approach each other; those surfaces of the jaw means which come against the collars being provided with several spaced notches in the longitudinal direction of the strap; several punches on the same level as the ends to be joined or on the opposite side of the base in relation to the ends, and adapted to be moved towards and away from the strap seal for corrugating and/or punching the strap ends and the strap seal parts surrounding them, when the punches are pressed into the notches in the jaw parts from both sides of the base or through the notches in the base; and means fitted to the frame structure for guiding the jaw parts and the punches and for actuating the same synchronically in relation to each other so that the punches corrugate and/or punch the strap seal essentially only when the jaw parts are closest to each other.

DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a side view of an advantageous embodiment of the invention as a cross section in which each of the two halves is shown in a different extreme position for better illustration,

FIG. 2 is a section along line A-B in FIG. 1 and shows one of its jaw parts in more detail,

FIG. 3 is a view from below of the same jaw part, and

FIG. 4 is a section along line C-D in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As can be seen in FIG. 1, a base 2 with vertical notches on both sides of the vertical middle plane in the longitudinal direction of the base has been fixed to the frame structure 1. In this case, there are three spaced notches on each side of the base.

A strap seal blank has been placed on the upper surface of the base 2. The width and the length of the blank are essentially the same as those of the upper surface of the base. The middle part 6 of the strap seal blank rests on the base and its collars 7 are directed upwards so that the strap iron ends 4 and 5 to be joined can be placed one on top of the other on the middle part 6 of the strap seal blank between the collars 7.

The upper part of the frame structure has been provided with two opposite slides or jaw parts 8 which can be slid, on the same horizontal plane as the seal blank, towards and away from each other. In the right half of FIG. 1, the jaw means 8 is in the open position immediately in front of the upward-directed collar 7, and in the left half, the jaw means 8 is in the closed position in which the jaw means are against each other.

The frame structure 1 has also be fitted with a vertical cylinder under the base 2. The piston bar 12 of the hydraulic cylinder can thus be moved in the vertical direction towards and away from the base. Arms 13 have been attached to the free end of the piston bar on its opposite sides. Those ends of these arms which are farthest from each other have been provided with suitably shaped guide surfaces 14.

Furthermore, horizontal shafts 16 which are parallel to the steel band have been attached to the frame structure symmetrically on both sides of its middle line. Twin-lever arms 15 have been fitted to the shafts 16 so that they can pivot. The lower ends of the twin-lever arms 15 are guided by means of rollers or the like to follow the guide surfaces 14 in order to turn the lever arms 15 in a controlled manner when the piston bar 12 moves in the vertical direction. The upper ends of the lever arms 15 have been fitted to the notches 11 in the lower surfaces of the jaw means 8 so that the pivoting movement of the lever arms can be transformed into a horizontal back-and-forth movement of the jaw means.

Several vertical punches 20 have also been attached to the free end of the piston bar 12 in the vertical direction, one under each notch 3.

As can be seen in more detail in FIGS. 2–4, the lower edges of those sides of the jaw means 8 facing each other have been cut so that the jaw means 8 can be moved to touch each other, in which case the upper surface 10 of the said recess is against the upper surface of the band seal. In the said upper surfaces 10 of the recesses in the jaw means 8 there are notches 9, one opposite to each notch 3 in the base 2.

In the position shown in the right half of FIG. 1, the sealing tongs are open, in which case the piston bar 12 is in its lowest position and the jaw means 8 are in the position farthest from each other, making it possible to place the band seal blank on the base 2 with its collars 7 directed upwards and with the band ends placed one on top of the other on the middle part 6 of the strap seal between the collars 7. When the piston bar 12 moves upwards, the guide surfaces 14 and the punches 20 attached to it move simultaneously at the same speed.

The punches **20** are pushed into the notches **3** in the base **2** but do not yet affect the strap seal. But the guide surfaces **14** turn the twin-lever arms **15** and force their lower ends **18** to follow the upper parts of the guide surfaces which are curved towards each other. When the guide surfaces **14** rise vertically upwards, their curved parts press the lower ends **18** of the lever arms **15** away from each other, in other words, the upper ends **17** of the lever arms **15** towards each other. These upper ends work together with the jaw means **8** and force them to approach each other. The upper surfaces **10** of the recesses in jaw parts **8** then press against the upward-directed collars **7** of the strap seal blank and bend them against the strap iron **4.** When the jaw means **8** meet, the lower ends **18** of the lever arms **15** have moved onto the vertical parts of the guide surfaces **14,** and then the guide surfaces **14** can move upwards in spite of the fact that the lever arms **15** can no longer turn. Only at this point of the movement of the piston bar **12** are the punches **20** pushed out from the notches **3** in the base **2** to above its surface and force part of the material of the strap seal and the strap iron into the notches **9** in the jaw means **8.**

The closing of the strap seal presses the strap iron ends together and already attaches them, but only corrugation of the edges of the strap seal creates a really durable and strong joint; the strength of this joint has been about 100 percent of the strength of the strap iron itself in pulling-strength tests.

Instead of corrugation, the edges of the strap seal can be cut and bent upwards, or holes can be punched in the middle of the band seal and the material thus detached can be bent upwards. In any case, the jaw means **8** close the strap seal blank around the strap iron ends and form a stop which keeps the band seal in place while the punches shape it.

In one alternative embodiment, the punches have been fitted perpendicular to its both sides of the same horizontal plane as the strap seal. In this case, the punches have a similar guide and operation mechanism as the jaw means, with the difference that the upper parts of the guide surfaces on opposite sides of the punches are vertical while their lower parts curve away from each other. In this case, the guide surfaces on the same side of the jaw means and the punches can be joined to form S-shaped guide surfaces. These guide surfaces on the opposite sides are mirror images of each other so that their upper parts which co-operate with the jaw means face each other, while their lower parts which co-operate with the punches face away from each other. The lever arms on the same side of the punches and the jaw means have then been advantageously fitted to pivot around the same shaft.

The hydraulic cylinder can be replaced by a suitable lever arm system for obtaining manually operated sealing tongs. It is also clear that there may be more than one pair of jaw means, and each jaw means pair can have its individual guide and operating system.

When the punches have been fitted horizontally on both sides of the band seal, the base naturally does not need to be notched. Instead, horizontal notches have been advantageously provided for the punches in the jaw parts.

What is claimed is:

1. Sealing tongs for attaching the ends of a metallic or non-metallic strap to each other with a strap seal made from a plate-like blank material adapted to form collars bent over the sides of the ends, the sealing tongs being provided with a base attached to a frame structure and on which the strap seal blank can be plated with its collars directed away from the base, and the band ends being placed on the middle part of the strap seal blank between the collars, comprising in combination:

at least two jaw means fitted to the frame structure and adapted for slidable movement transversely in relation to the strap and in a straight line towards and away from each other on the same plane to bend the collars of the strap seal blank against the strap as the jaw means approach each other; those surfaces of the jaw means which come against the collars being provided with several spaced notches in the longitudinal direction of the strap;

several punches on the same level as the ends to be joined and adapted to be moved towards and away from the strap seal for corrugating and/or punching the strap ends and the strap seal parts surrounding them, when the punches are pressed into the notches in the base; and

means fitted to the frame structure for guiding the jaw parts and the punches and for actuating the same synchronically in relation to each other so that the punches corrugate and/or punch the strap seal essentially only when the jaw parts are closest to each other.

2. The sealing tongs of claim **1,** in which the means for guiding and moving the jaw means and the punches comprise: a hydraulic cylinder fixed to the frame structure on the opposite side of the base in relation to the strap, a piston bar of the cylinder being adapted for movement perpendicularly towards the base and away from it; guide surfaces fixed to the piston bar on its opposite sides; two twin-lever arms pivoting around a shaft parallel to the strap, fitted to the frame structure on opposite sides of the piston bar, one end of each lever arm co-operating with the guide surfaces and the other ends of the lever arms co-operating with the jaw means to force them towards and away from each other when the piston bar is actuated, and the punches, also fitted to the piston bar perpendicularly in relation to the base and opposite to its notches, having such a length that they are pushed out from the notces in the base essentially only when the jaw means are closest to each other and into the notches in the jaw parts only at their extreme upper position.

3. The sealing tongs of claim **2,** in which those ends of the guide surfaces facing the jaw means curve inwards towards each other in order to force those ends of the twin-lever arms which co-operate with the guide surfaces away from each other and to force the other ends of said arms towards each other, when the piston bar and the guide surfaces move towards the base, and the remaining parts of the guide surfaces being parallel to the piston bar in order to keep the lever arms and the jaw means in place when the piston bar, the punches, and the guide surfaces move further.

4. The sealing tongs of claim **1,** in which said several punches are on the same level as the strap ends to be joined, on both sides of said strap ends, opposite to the notches in the jaw means, the means for guiding and moving the jaw parts and punches synchronically in relation to each other comprising a hydraulic cylinder fixed to the frame structure on the opposite side of the base in relation to the steel band, its piston bar being

adapted to be moved perpendicularly towards and away from the base; two pairs of twin-lever arms pivoting around shafts parallel to the band, fitted to the frame structure on opposite sides of the piston bar; guide surfaces for the lever arms, fixed to the piston bar on its opposite sides, one end of the lever arm of one of the pairs both co-operating with the jaw parts and the other ends cooperating each with its own guide surface, those ends of the guide surfaces facing the jaw means curving inwards towards each other, the remaining part being parallel to the piston bar, while one end of the lever arms of the other pair of opposite lever arms both co-operate with the punches and the other ends co-operate each with its own guide surface, those ends of these guide surfaces which face the punches being parallel to the piston bar in order to keep the lever arms and punches which work together with them in place and separate from the strap seal when the piston bar moves upwards and the jaw means approach each other, and the remaining parts of these guide surfaces being formed to curve away from each other so that the lever arms which co-operate with them force the punches into the material of the band seal to corrugate it essentially only after the jaw means have stopped on the strap seal.

5. The sealing tongs of claim **4,** in which the lever arms on the same side of the piston bar have been adapted to pivot around the same shaft.

6. The sealing tongs of claim **4,** in which the guide surfaces on the same side of the piston bar have been joined to form an S-shaped guide surface, its upper half co-operating with the lever arm which co-operate with the jaw part, and its lower half co-operating with the lever arm co-operating with the punches.

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