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DIE FOR FORMING TIES FOR BOX STRAPS

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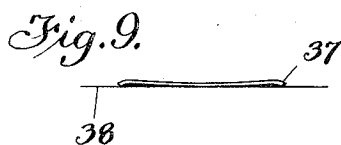
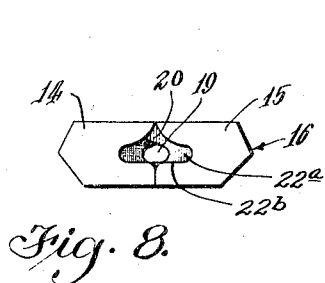
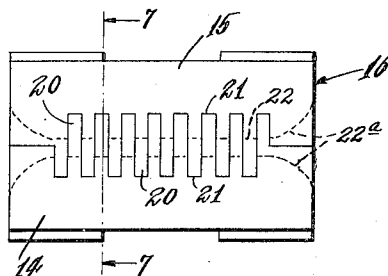
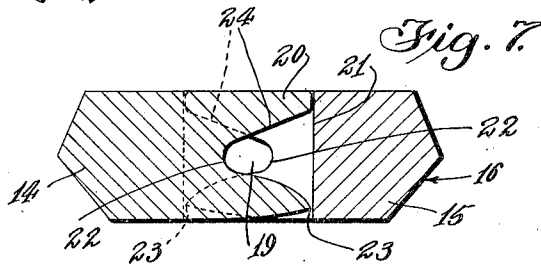
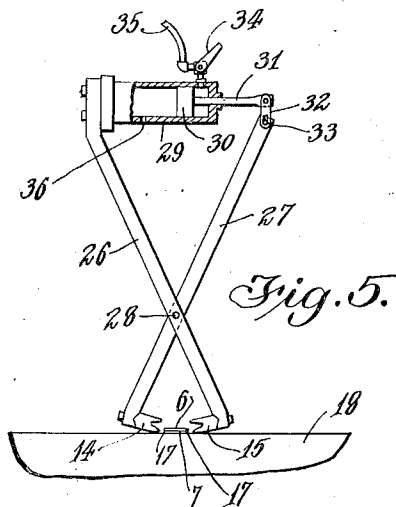
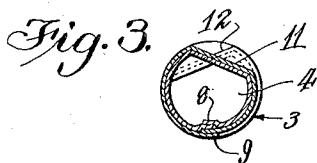
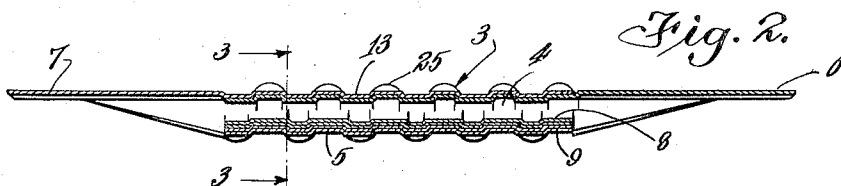
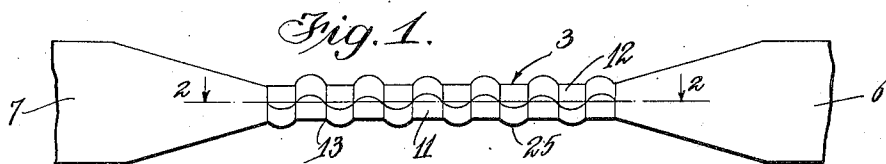


Fig. 6.

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DIE FOR FORMING TIES FOR BOX STRAPS

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This invention relates to a die for forming ties for binding straps such as used for binding boxes, bales or other articles.

The straps upon which this die operates to produce a tie are of substantially flat form, and in forming the tie the strap is placed around a box, bale or any other article to be banded, with the ends of the strap overlapping each other. The die is formed in sections which engage the opposite edges of the overlapping ends of the strap and move together so as to roll the overlapping ends of the strap into each other so as to form a tie that will effectively resist tension in the strap. The tie has special characteristics in its construction which enable it to resist a pull, and the efficiency of the tie is due largely to the fact that in addition to being rolled together the material of the overlapping ends is offset laterally from opposite sides so as to form interlocking shoulders which prevent a relative longitudinal movement of the crimped or rolled portions of the strap.

The general object of this invention is to produce a simple die for forming a tie of the character referred to capable of resisting the tension developed in the strap.

A further object of the invention is to produce a die which is of simple construction and which can be readily applied to the overlapping ends of a flat or curved box strap so as to roll the same together and produce an effective tie between the same.

Further objects of the invention will appear hereinafter.

The invention consists in the novel parts and combination of parts to be described hereinafter, all of which contribute to produce an efficient die for forming ties for binding straps.

A preferred embodiment of the invention is described in the following specification, and the broad scope of the invention is pointed out in the appended claims.

In the drawing:—

Figure 1 is a plan of a tie which may be formed with my novel die; this view is upon a slightly enlarged scale;

Figure 2 is a vertical section through the tie and contiguous portions of the strap taken about on the line 2—2 of Figure 1;

Figure 3 is a cross section through the tie on the line 3—3 of Figure 2 but upon an enlarged scale;

Figure 4 is a view on the same scale as Figure 3 and showing how the two overlapping ends of the strap are rolled together into tubular form, the roll formed of one end telescoping within the roll formed by the other end;

Figure 5 is a side elevation in partial section illustrating the die and the means for operating the same; this view also illustrates a portion of

the top of the box upon which the overlapping strap has been placed preparatory to forming a tie in it;

Figure 6 is a plan of the die upon an enlarged scale;

Figure 7 is a cross section through the die taken on the line 7—7 of Figure 6; and

Figure 8 is an end view of the die.

Figure 9 is an end view showing the preferred shape of box strap.

Before proceeding to a detailed description of the die, it will facilitate the disclosure to describe the characteristic features of the tie 3 which is formed by the die. This tie consists of two co-axial rolls 4 and 5, the former of which is produced on the end 6 of the strap or band, and the latter of which is formed on the end 7 of this strap. In forming these co-axial rolls, the ends of the band are overlapped together as illustrated in Figure 5.

In the embodiment of the invention illustrated, the die which forms the tie, bends the ends around first giving them substantially the tubular form illustrated in Figure 4 with one tubular end telescoped with the other. In other words, in forming the tie the inner roll 4 is formed on one end of the strap within the roll 5 which is formed on the other end of the strap. When the rolling operation is completed, the edges 8 of the inner roll 4 will overlap each other in some such manner as that indicated in Figure 3. If desired, the roll may be formed so that the edges 9 of the outer roll will abut against each other or slightly overlap so that they project past each other circumferentially. However, the rolls are formed with the edges 8 and 9 lying adjacent to each other and on the same side of the longitudinal axes of the rolls.

The die distorts and offsets the material of these rolls in such a way that they interlock with each other, and this prevents them from opening up when the tie is subjected to tensile strains. In doing this, the die forms offset portions 11 in the rolls on one side of the vertical plane passing through the longitudinal axis of the tie and it also forms a plurality of similar offset portions 12 in the walls of the rolls on the other side of this vertical plane. The offset portions 12 are intermediate or alternated with the offset portions 11 so that an alternating or corrugated effect is produced in the tie, resulting in the formation of a plurality of necks 13. The offset portions 11 and 12 are formed respectively by the opposite die sections or jaws 14 and 15 which cooperate to produce the complete die 16. In other words, this die is formed of two sections the inner faces of which approach each other when operated to form the tie. Figure 5 shows the sections of the die separated and ready to be applied to the opposite edges 17 of the overlapping ends 6 and 7

of the strap lying on the upper face of a box 18. Any suitable means may be employed for bringing the inner faces of these die sections forcibly together. The meeting faces of the die members or die sections co-operate to form a tubular bore 19 passing from end to end of the die (see Figure 7), and each die section is formed with a plurality of projections or fingers 20 which are received in corresponding slots 21 formed in the opposite die (see Figure 6). The die members are formed with opposed grooves extending along the series of projections 20, so that the ends of these fingers are formed with U-shaped sockets 22 with diverging mouths (see Figure 7), and each finger is preferably formed on its forward and lower end with a toe 23 which operates as the die sections come together, to engage under the adjacent edge 17 of the strap. As the inner faces of the die members approach each other, the overlapping ends of the strap are guided into place between the jaws and compressed in this way from each side so that the material in the two ends of the strap assumes the general tubular shape as indicated in Figure 4. In other words, two telescoping tubes or sleeves are formed between the adjacent faces and in the gap or "bore" 19 of the die.

It will be evident that as the jaws come together the opposing U-shaped sockets cooperate to form an oval or oblong cavity, elongated in a horizontal direction, that is to say, in a plane substantially parallel with the plane of the strap ends. This cavity gradually changes its form to a substantially circular cross-section as the jaws complete their approaching movement. The sockets 22 are of sufficient depth that the jaws will completely envelop the overlapped ends before the rolling of the metal begins.

In the last part of the closing movement of the die, the inclined upper faces 24 of the sockets which are inclined at about 30° produce offset portions 11 and 12; that is to say, at the same time that the ends are rolled together the material is offset by the alternating fingers 20 so as to produce the offsets 11 and 12, the effect of which is that in the rolls a plurality of shoulders 25 are formed throughout the length of the roll. These shoulders at which the material is offset effectively prevent the tubes from moving relative to each other.

In order to prevent the formation of an abrupt edge, or shoulder, at the ends of the telescoping rolls, which might tend to weaken the connection of the tie to the remainder of the strap, I form the ends of the die with diverging faces 22a (see Figure 6). These faces 22a at the point where they are nearest to each other are substantially in line with the bottoms of the U-shaped sockets 22; in other words, at the ends of the jaws there are laterally enlarged mouths 22b (see Figure 8). The result of this is that when the dies are used to form the tie, the end portions of the tie gradually enlarge in width; in other words, from the middle portion of the tie which is of cylindrical cross-section, the tie tapers out to the full width of the strap.

As stated above, any suitable means may be provided for opening and closing the die. For example, I may mount the two die sections on two levers 26 and 27 pivoted together at 28. One of these levers may be provided with an air cylinder 29 and the other lever may be operated by a piston 30, the rod 31 of which is connected by a cross-head 32 with the end of the lever 27. This cross-head may be connected to the lever 27

through the medium of a pin-and-slot connection 33. If desired, the cylinder 29 may be a hydraulic cylinder. In any case, the operating fluid may be admitted to one end of the cylinder through a suitable hand controlled valve 34 to which the operating fluid is supplied through a suitable hose 35.

In order to prevent the die sections from striking too forcibly together, the cylinder may be provided with an exhaust port 36 which permits the operating fluid to exhaust just as the die sections reach the limit of their inward movement.

In using the dies to operate upon flat box straps, occasionally there is a tendency for the edge of the strap when engaged by the die sections to turn upward instead of downward. In order to prevent this, the strap may be formed with a very slight downward curve, as indicated at the point 37 in Figure 9. In this view the straight line 38 indicates the top of the box. The bend at the points 37 need not displace the edge of the material more than one one-hundredth of an inch from its normal position. The body of the strap lies flat upon the box and is in contact with it all the way across the strap.

It is understood that the embodiment of the invention herein described is only one of many embodiments this invention may take, and I do not wish to be limited in the practice of the invention nor in the claims to the particular embodiment set forth.

What I claim is:

1. A die for forming a tie in two overlapping ends of a binding strap, having a pair of jaws, said jaws having fingers on their meeting faces with slots between the fingers to receive the fingers of the opposite jaw, said fingers having sockets capable of receiving the said overlapping ends and co-operating to produce two telescoping rolls in the said overlapped ends of the strap, said sockets having diverging mouths on their adjacent sides with guide faces for guiding the overlapped ends into the jaws, and having other faces co-operating to offset the material of the two rolls and produce interlocking shoulders in the same.

2. A die for forming a tie in the overlapping ends of a binding strap, having a pair of jaws, said jaws having fingers on their meeting faces and slots between the fingers to receive the fingers of the opposite jaw, said jaws further having toes to engage under the side edges of the ends of the strap and co-operating to produce two telescoping rolls in the overlapped ends with the edges of the rolls lying adjacent to the face of the article to which the strap is applied, said fingers having sockets on their meeting faces with inclined faces operating to offset the material of the rolls on their upper sides remote from the said edges to produce interlocking shoulders in the same.

3. A die constructed to receive two overlapping ends of binding straps to form a tie in the same, and having a pair of jaws capable of moving apart and out of contact with each other, and having sockets on their meeting faces, said sockets having diverging mouths facing each other and co-operating to produce two telescoping rolls of the said overlapped ends, and having means for offsetting the material of the two rolls to produce interlocking shoulders in both said ends.

4. A die for forming a tie in the overlapping ends of a binding strap lying on a supporting surface, having a pair of jaws with sockets on their meeting faces, said jaws having toes for engag-

ing under the strap ends to guide the same into the die, and cooperating to hold the ends overlapping in the die and bend the same simultaneously to produce two telescoping rolls with the edges of the overlapping ends adjacent to each other on the same side of the rolls, said jaws having means for offsetting the material of the two rolls to produce interlocking shoulders on the side of the roll opposite to the said edges.

5. A sealing tool comprising a pair of pivotally connected levers having confronting deforming jaws on one side of the pivot, said jaws each having a projecting lip overhanging the work engaging deforming surfaces of the jaw and a notch for receiving the lip of the other jaw so that when the jaws are closed the lips extend beyond the plane of the center of the pivot.

6. A sealing tool comprising a pair of levers pivoted together to operate like a pair of shears and having confronting deforming jaws on one side of the pivot, each jaw having projecting lips overhanging the work engaging surfaces of the jaws and notches arranged so that the lips of one jaw lie opposite the notches of the other jaw and the length of the lips and depth of the notches being such that the lips extend beyond the plane of the center of the pivot when the jaws are closed.

7. A sealing tool for crimping edgewise overlapped metal bands to interconnect the same, comprising a pair of confronting jaws movable toward and from each other in the direction of the plane of the bands, each jaw having a band crimping surface, a projecting lip and a notch, the crimping surface of each jaw lying to the rear of the lip thereof and the notch of one jaw positioned to receive the projecting lip of the other jaw and permit the lips to pass beyond the median plane between the jaws so that the surfaces of the jaws may form a closed flat abutment for preventing extrusion of the crimp therebetween.

8. A sealing tool for crimping edgewise overlapped metal bands to interconnect the same, comprising a pair of jaws pivoted together to move toward each other, each jaw having a projecting lip and a notch, the lip of one jaw being received in the notch of the other when the jaws are brought together so that the projecting lips may pass beyond the median plane between the jaws, and a band-edge crimping surface carried by each jaw to the rear of the projecting lip thereof to come into action to crimp the bands while the overlapping projecting lips prevent extrusion of the crimp between the jaws.

9. A die for forming a tie in two overlapping ends of a binding strap, having a pair of jaws, said jaws having fingers on their meeting faces with slots between the fingers to receive the fingers of the opposite jaw, said fingers having sockets capable of receiving the said overlapping ends and cooperating to produce two telescoping rolls in the said overlapped ends of the strap, said sockets having diverging mouths on their adjacent sides with guide faces for guiding the overlapped ends into the jaws, and having other faces cooperating to offset the material of the two rolls and produce interlocking shoulders in the same, said sockets being of sufficient depth to completely envelop the overlapped ends before said other faces cooperate to produce the said interlocking shoulders.

10. A die constructed to receive two overlapping ends of a binding strap to form a tie in the same, and having a pair of jaws capable of mov-

ing apart and out of contact with each other, and having sockets on their meeting faces, said sockets having diverging mouths facing each other and cooperating to produce two telescoping rolls of the said overlapped ends, and having means for offsetting the material of the two rolls to produce interlocking shoulders in both said ends, said sockets being of sufficient depth to completely envelop the overlapped ends before the offsetting means operates to produce the said interlocking shoulders.

11. A die for forming a tie in two overlapping ends of a binding strap, having a pair of jaws, said jaws having fingers on their meeting faces with slots between the fingers to receive the fingers of the opposite jaw, said fingers having sockets capable of receiving the said overlapping ends and cooperating to produce two telescoping rolls in the said overlapped ends of the strap, said sockets having diverging mouths on their adjacent sides with guide faces for guiding the overlapped ends into the jaws, and having other faces cooperating to offset the material of the two rolls and produce interlocking shoulders in the same, the ends of said jaws having opposed diverging faces to produce a gradually enlarged width of the tie where it connects with the body of the strap.

12. A die constructed to receive two overlapping ends of a binding strap to form a tie in the same, and having a pair of jaws capable of moving apart and out of contact with each other, and having sockets on their meeting faces, said sockets having diverging mouths facing each other and cooperating to produce two telescoping rolls of the said overlapped ends, the ends of said jaws having opposed diverging faces to produce a gradually enlarged width of the tie where it connects with the body of the strap.

13. A tie former including two cooperating die members having meshing series of projections with slots between the projections to receive the projection of the opposite die member, the inner faces of said die members having opposing grooves with diverging faces leading thereto and cooperating to form a gap between the members to receive flat overlapped parts to be formed into a tie, said faces operating to engage and bend the flat overlapped parts and cooperating to form an elongated inner roll and an outer roll of the same, some of the faces of said projections operating to distort the walls of the said rolls laterally at a plurality of points throughout the length of the tie, and said members being capable of movement to effect a separation of the inner faces of said projections for withdrawal of the formed tie.

14. A die constructed to receive two overlapping ends of a flat binding strip to form a tie in the same, said die having a pair of cooperating jaws with adjacent faces, said jaws movably mounted so that when the die is operated the said faces approach each other, said faces having sockets, said sockets having diverging mouths facing each other and cooperating to bend the flat ends transversely and produce two telescoping rolls of the said overlapped ends, said sockets having means for distorting the material of the two rolls in a lateral direction to interlock the overlapped ends to each other, said sockets being of sufficient depth to completely envelop the overlapped ends before the distorting means operates to produce the lateral distortion.