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Behlen et al.

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[45] **Apr. 24, 1973**

[54] **METHOD OF JOINING STRIP MATERIAL**

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[73] Assignee: **Behlen Manufacturing Company, Inc.,** Columbus, Nebr.

[22] Filed: **Nov. 23, 1970**

[21] Appl. No.: **92,197**

Related U.S. Application Data

[63] Continuation of Ser. No. 665,875, Sept. 6, 1967, abandoned.

[52] **U.S. Cl.** .....**29/432,** 29/21.1, 29/509, 29/521, 113/116 FF, 287/189.36 D

[51] **Int. Cl.** **B23p 11/00**

[58] **Field of Search**.....29/509, 432, 21.1, 29/521, 432.2; 113/116 FF; 287/189.36 D

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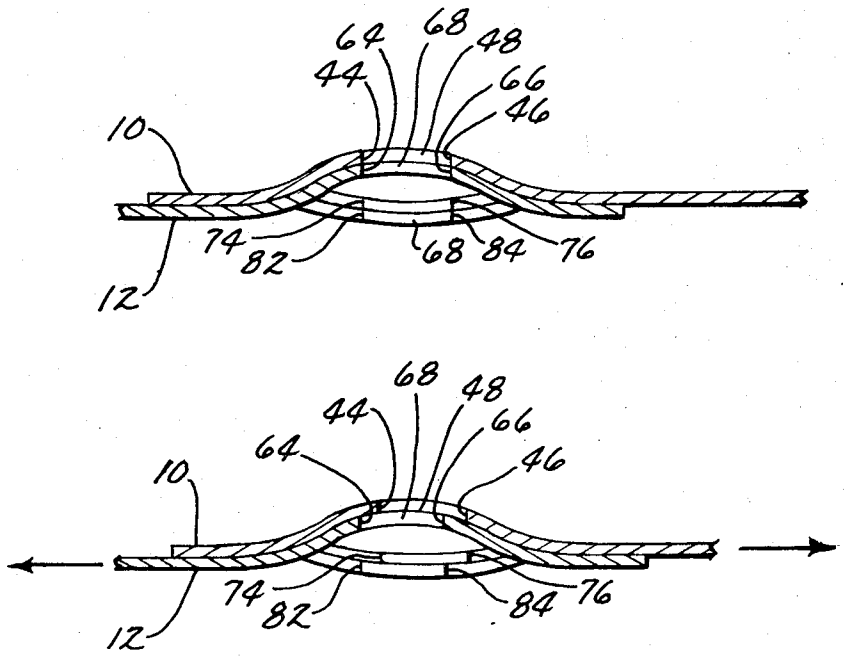
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[57] **ABSTRACT**

The method of bonding a pair of strips of material together, comprising, simultaneously deforming a portion of material out of each of the sheets and then longitudinally moving the sheets with respect to each other whereby the deformed portions will interlock to bond the sheets together. The joint formed by deforming the sheets effectively bonds the two sheets together thereby preventing any separation thereof.

3 Claims, 8 Drawing Figures



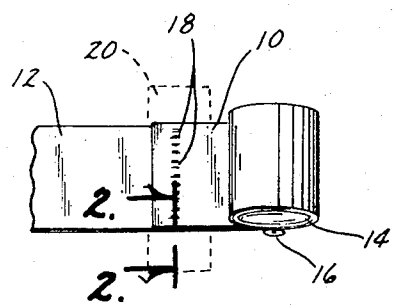


Fig. 1

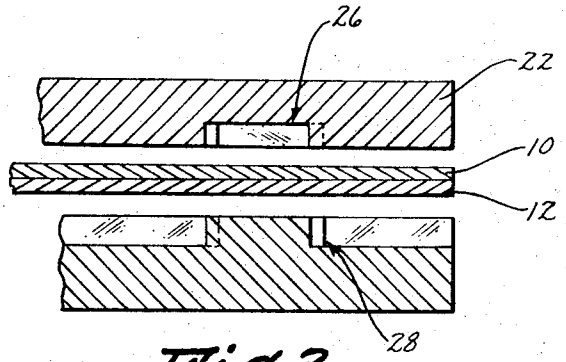


Fig. 2

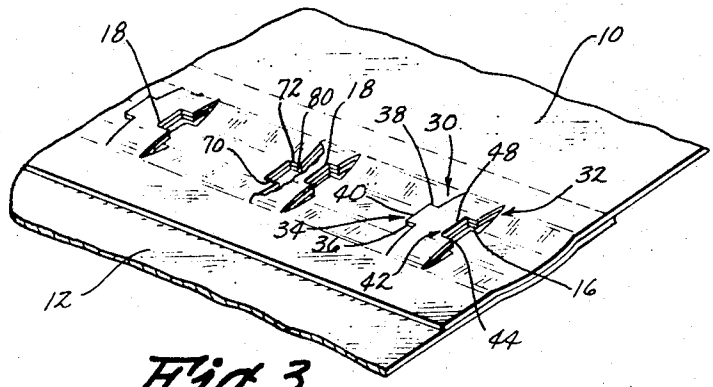


Fig. 3

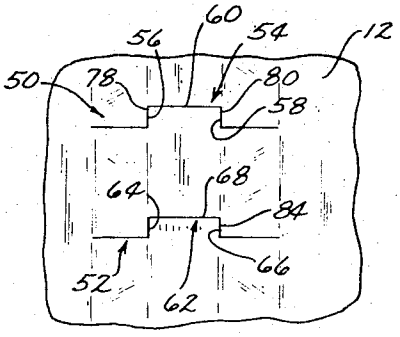


Fig. 8

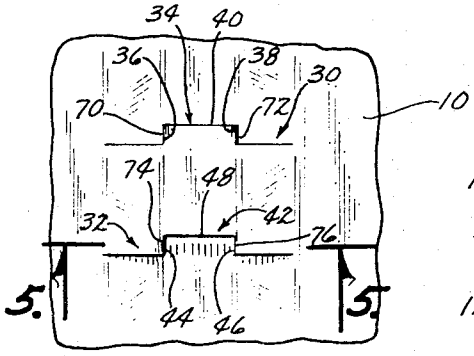


Fig. 4

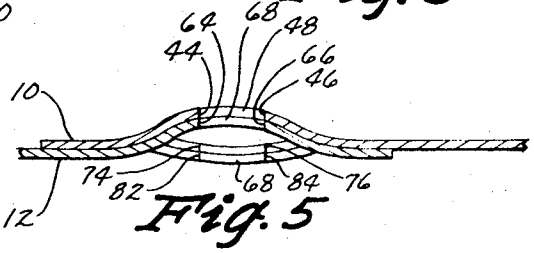


Fig. 5

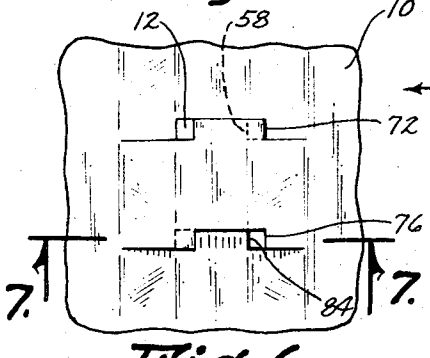


Fig. 6

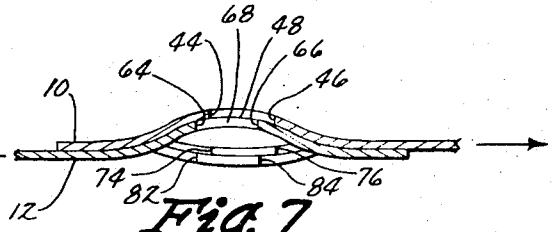


Fig. 7

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METHOD OF JOINING STRIP MATERIAL

This application is a continuation of application Ser. No. 665,875, now abandoned, filed Sept. 6 1967.

In working with rolls or coils of metal sheets or the like it is necessary from time to time to secure sheets together in metal processing operations which require continuous operation or uninterrupted strips. In these operations, an unsatisfactory connection between the tail end of one sheet and the lead end of a second sheet will result in "losing" a production line. That is, the entire production line must be shut down so that the two sheets can be secured together to obtain the continuous operation or uninterrupted strip. Some attempt has been made to join two strips or sheets together by rolling the edges thereof but this method is unsatisfactory for use on extremely hard metals. The hard metals will break when an attempt is made to roll the edges thereof.

Therefore, it is a principal object of this invention to provide a method of bonding a pair of sheets of material together.

A further object of this invention is to provide a method of bonding a pair of sheets of material which provides for interlocking the two sheets upon the sheets being placed in tension.

A further object of this invention is to provide a method of bonding a pair of sheets or strips together wherein a portion of material is simultaneously deformed out of each of the sheets or strips and the strips are then longitudinally moved with respect to each other to cause the interlocking of the same.

A further object of this invention is to provide a method of bonding a pair of sheets of material together which will satisfactorily bond sheets comprised of extremely hard metal.

A further object of this invention is to provide a method of joining strip materials which permits continuous operation or uninterrupted strip operations.

A further object of this invention is to provide a metal stitch or joint which bonds a pair of superimposed sheet members together.

A further object of this invention is to provide a method of joining strip materials which does not require foreign material such as bolts or rivets.

A further object of this invention is to provide a method of joining strip materials which is economical.

These and other objects will be apparent to those skilled in the art.

This invention consists in the construction, arrangements, and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, specifically pointed out in the claims, and illustrated in the accompanying drawings in which:

FIG. 1 is a fragmentary perspective plan view of a pair of rolls of sheet material having portions fastened together with a plurality of joints;

FIG. 2 is a fragmentary cross-sectional view illustrating the male and female die head which is used to form the joint of this invention;

FIG. 3 is a fragmentary perspective view of two sheets joined together;

FIG. 4 is a top plan view of the sheets after the same have been deformed but before the sheets have been shifted or longitudinally moved with respect to each other;

FIG. 5 is a sectional view as seen on lines 5—5 of FIG. 4;

FIG. 6 is a top plan view similar to FIG. 4 after the sheets have been longitudinally moved or shifted with respect to each other to interlock the sheets;

FIG. 7 is a sectional view as seen on lines 7—7 of FIG. 6; and

FIG. 8 is a top view of the lower deformed sheet.

In FIG. 1, two sheets of material **10** and **12** are shown being dispensed from a pair of rolls **14** and **16** respectively. A plurality of splices or joints **18** have been formed between the two sheets of material **10** and **12** by a conventional strip joining press which is generally designated by the reference numeral **20** and is merely illustrated in FIG. **1** to show the relationship of the press to the joints **18** and the two rolls of material.

Press **20** includes an upper die half **22** and a lower die half **24** which are movable towards each other to form the joints **18** in the sheets **10** and **12**. The upper die half **22** includes a female element **26** while the lower die half **24** includes a male element **28**.

The die half **24** and die half **22** are moved towards each other thereby causing sheets **10** and **12** to be sheared and deformed according to the design of the die halves which produces the joint **18**. For purposes of description for each of the joints **18**, sheet **10** is deformed to define opposite sides **30** and **32** which are parallel to the longitudinal axis of the sheet. A tab **34** extends laterally from side **30** and is defined by shoulders **36, 38** and side edge **40**. Side **32** is provided with a rectangular notch **42** defined by shoulders **44, 46** and side edge **48**. Sheet **12** is deformed to define opposite sides **50** and **52** which are parallel to the longitudinal axis of the sheet. A tab **54** extends laterally from side **50** and is defined by shoulders **56, 58** and side edge **60**. Side **52** is provided with a rectangular notch **62** defined by shoulders **64, 66** and side edge **68**.

The deforming of the sheets **10** and **12** also causes various notches and shoulders to be formed in the sheets adjacent to the joints **18**. For purposes of description, sheet **10** will be described as having shoulders **70** and **72** which are complementary to shoulders **36** and **38** respectively. Sheet **10** also has a pair of shoulders **74** and **76** formed by the shearing operation which are complementary to shoulders **44** and **46** respectively. The shearing of sheet **12** causes shoulders **78** and **80** to be formed opposite shoulders **56** and **58** respectively and shoulders **82** and **84** to be formed opposite shoulders **64** and **66** respectively.

The shearing of the sheets **10** and **12** causes shoulders **44, 64, 74** and **82** to be formed and positioned in a vertical alignment as illustrated in FIG. **5**. The shoulders **46, 66, 76** and **84** are also formed during the shearing operation and these shoulders are also vertically aligned as seen in FIG. **5**. As previously stated, FIG. **5** illustrates the relationship of the various shoulders, tabs and notches prior to the sheets being shifted with respect to each other. FIG. **7** illustrates the relationship of the various shoulders, tabs and notches after the sheets have been shifted with respect to each other. The sheets are shifted with respect to each other inasmuch as there will be a pull on sheet **12** and a certain amount of tension or drag on sheet **10** which will cause the sheet to be moved from the position of FIG. **5** to the position of FIG. **7** with respect to each other. The shift-

ing of the sheets causes the joining of the sheets at each of the joints **18**. After the sheets have been shifted, shoulder **64** will be positioned longitudinally of shoulder **44** and positioned below the sheet **10** while shoulder **46** will be positioned longitudinally of shoulder **66** and above sheet **12**. The shifting of the sheets also causes shoulder **82** on sheet **12** to be moved longitudinally with respect to shoulder **74** on sheet **10** while shoulder **84** will also be moved longitudinally with respect to shoulder **76**. Thus, after the sheets have been shifted, tab **34** will be positioned over shoulder **70** while tab **54** will be positioned above shoulder **38** to prevent separation of the sheets. The same is also true at the opposite side of the joint wherein the tab in sheet **10** between shoulders **74** and **76** will be partially positioned below the shoulder **64**. In effect, the shifting of the sheets with respect to each other causes the tabs to be positioned above and below various shoulders thereby locking the sheets together to prevent any possible separation thereof. The sheets will be even more securely joined if a greater amount of tension is exerted on the sheets so it is virtually impossible to separate the sheets.

Thus it can be seen that a method has been described for joining sheets together which is relatively simple but extremely efficient and foolproof. Thus, it can be seen that all of the objectives of this invention have been accomplished.

We claim:

1. The method of bonding a pair of sheets of material together, comprising,

simultaneously shearing and deforming a portion of material out of each of a pair of stacked sheets,

said sheared and deformed portion each including opposite sides which are parallel to the longitudinal axis of the sheets, one of said sides having a tab portion extending therefrom, the other of said sides having a notch formed therein, a tab portion being formed in each of said sheets immediately adjacent said notch, and a notch being formed in said sheets immediately adjacent said tab portions in said sheared and deformed portions, said notches being defined by opposite shoulders having a side edge extending therebetween,

said tab portions being defined by opposite shoulders having a side edge extending therebetween,

said shoulders being transversely disposed to the longitudinal axis of the sheets,

and longitudinally moving said sheets with respect to each other to cause said sheared and deformed portions to interlock and to bond said sheets together, said sheets being interlocked by means of the shoulders of one of the tab portions of the sheared and deformed portions on one of said sheets being moved longitudinally over the shoulders of the notch in the other of said sheets, and by means of the shoulders of one of the tab portions on said one of said sheet members being moved longitudinally under the shoulders of the notch in the sheared and deformed portion of the other of said sheets.

2. The method of claim **1** wherein said deformed portions have a portion thereof extending upwardly from said sheets, at least some of said tab portions and notches being spaced above said sheets.

3. The method of bonding a pair of sheets of material together, comprising the steps of:

simultaneously providing individual, generally longitudinal slits in each of a pair of stacked sheets and simultaneously deforming a portion of material on one lateral side of each slit out of the plane of a portion of material on the laterally opposite side of said slit, the slits in one of said sheets being aligned with the slits in the other of said sheets;

each slit including,

a pair of longitudinally spaced slit portions which are parallel to the longitudinal axis of the sheets, and

an intermediate slit portion joining said longitudinally spaced slit portions to define a laterally projecting tab in one of said portions of material and a complemental, laterally projecting notch in the other of said portions of material, the tabs and notches in one of said sheets being aligned with the tabs and notches in the other of said sheets,

each intermediate slit portion including longitudinally spaced, slit sections extending laterally of said axis; and

longitudinally moving at least one of said sheets with respect to the other to cause the tabs and notches on said one sheet to be longitudinally disaligned with the tabs and notches of said other sheet to interlock said sheets together.

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