May 14, 1957 E. W. BRUNS 2,792,060

APPARATUS FOR SLITTING AND COILING LINES

Filed June 17, 1954 2 Sheets-Sheet 1

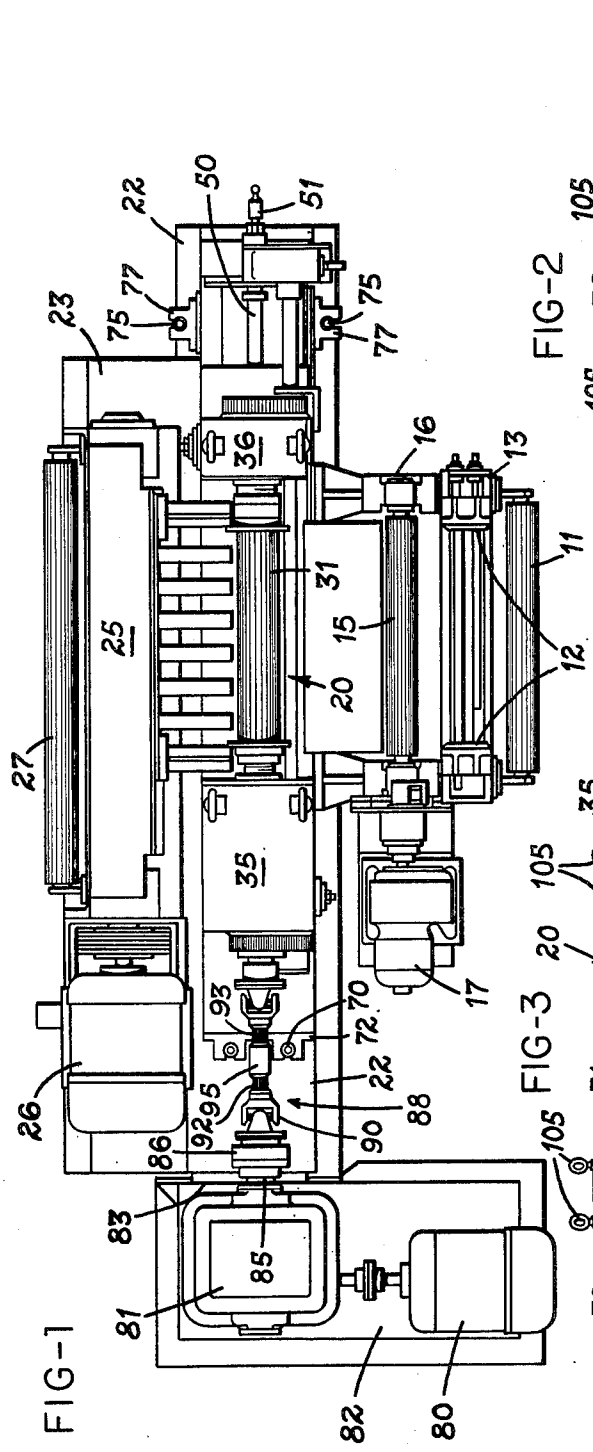


FIG-1

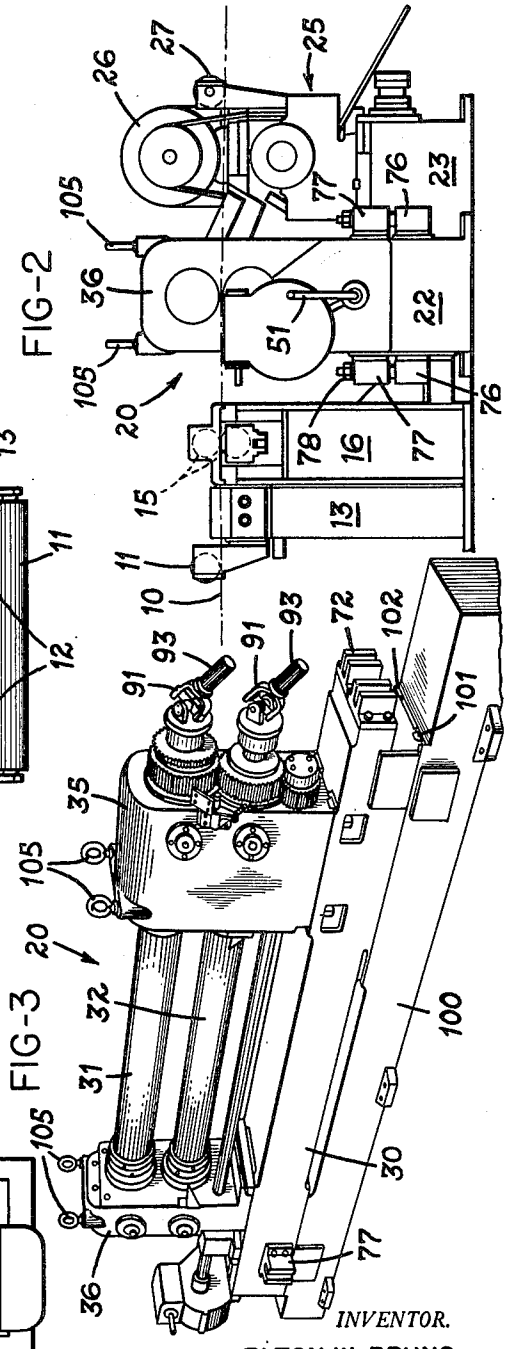


FIG-2

FIG-3

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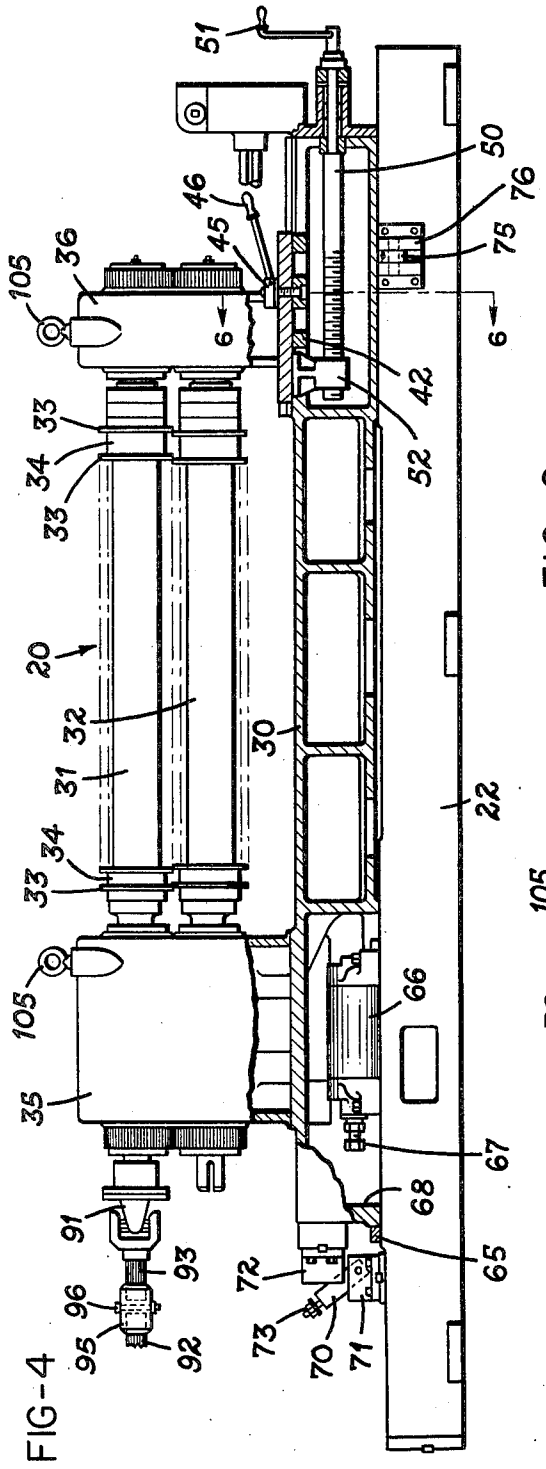


FIG-4

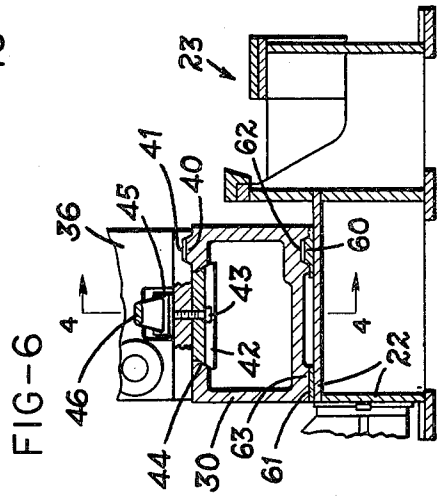


FIG-6

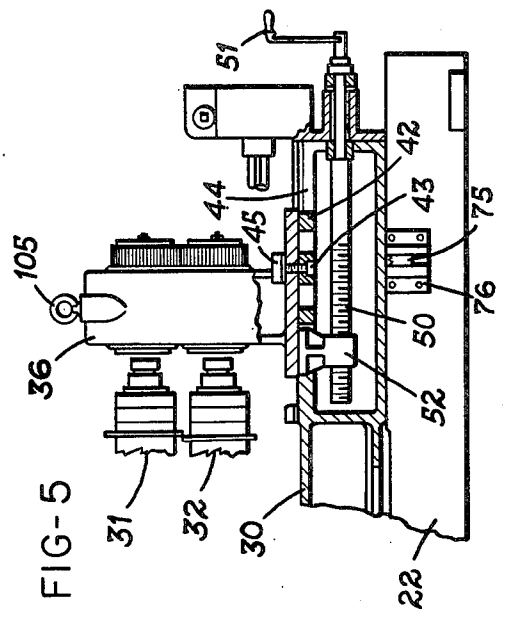


FIG-5

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APPARATUS FOR SLITTING AND COILING LINES

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Application June 17, 1954, Serial No. 437,547

2 Claims. (Cl. 164—61)

This invention relates to slitting apparatus for sheet materials and particularly for sheet metals.

The invention has special application to slitting and coiling lines for handling sheet metal at high speed to slit a wide web of metal into two or more narrow bands and then to recoil the resulting plurality of bands or to shear them into shorter lengths. Slitting lines of this character are often subject to a considerable range of requirements with respect both to the width of the wide web to be slit thereon and to the widths of the narrower webs to be produced, and this is particularly the case where such slitting lines are employed in factories to provide multiple bands of sheet material for further fabricating operations. Such conditions result in frequent fluctuation in the requirements for setting or adjusting the slitting unit in the line.

More particularly, the slitting members in a slitting line commonly take the form of a pair of parallel arbors carrying a plurality of sets of complementary disk cutters and cooperating spacers to establish the proper lateral spacing of the cutters. Since highly accurate control over widths of the slit bands is desired, it is a common practice to employ spacer collars of accurate width between adjacent cutters on each arbor. Changing of the cutter spacing accordingly requires removal of the cutters and spacer collars from the ends of the arbors and replacement by other spacer collars, and this is a relatively lengthy operation and may require as long as three to four hours. Quite apparently, if such operation is performed with the slitting unit remaining in the line, this means a similar period of non-production for the entire line, which includes a considerable quantity of other expensive equipment, with a corresponding increase in the overall cost of operation.

It is a primary object of the present invention to provide a slitter construction for a slitting line which will greatly reduce the unproductive time of the line between changes in the output requirements thereof by making it possible to effect such changes in the line in a small fraction of the time ordinarily required to adjust and reset the slitting cutters.

A further object is to provide a slitter construction for a slitting line wherein the slitting cutters are embodied in a slitter head which is constructed for quick and easy removal as a unit from the slitting line and replacement by a similar slitter head unit, and wherein each slitter head is also constructed for resetting of the cutters therein while removed from the slitting line in order to reduce to a minimum the time required for change of the output requirements of the line as a whole.

An additional object is to provide a slitter construction as outlined above which includes a main base for permanent installation in the slitting line and a plurality of removable and replaceable slitter head units for interchangeable use on the main base in accordance with changes in the output requirements of the line.

It is also an object of the invention to provide a slitter construction as outlined above in which the main base and each slitter head unit include complementary parts constructed for rapid cooperative operation during exchange of the slitter head to effect rapid accurate indexing of the new slitter head in the proper alignment with the other units in the slitting line and thereby to minimize the unproductive time of the line.

Additional objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

Fig. 1 is a plan view showing somewhat diagrammatically the general arrangement of a slitter unit constructed in accordance with the present invention;

Fig. 2 is an end view looking from right to left in Fig. 1;

Fig. 3 is a perspective view showing the removable and replaceable slitter heads for use in the assembly of Fig. 1;

Fig. 4 is a side elevation of Fig. 3 with portions of the base broken away as indicated generally by the line 4—4 of Fig. 6;

Fig. 5 is a fragmentary view similar to Fig. 4 and showing the adjustable housing for the slitting orifice partially removed to provide for resetting of the slitting cutters; and

Fig. 6 is a fragmentary section of a somewhat larger section taken approximately on the line 6—6 of Fig. 4 and on a larger scale.

Referring to the drawings, which illustrate a preferred embodiment of the invention, Figs. 1 and 2 show a general arrangement of slitting and guiding apparatus in a slitting line. The web 10 of sheet stock is fed from left to right in Fig. 2 from an unwind stand (not shown) under the entry roll 11 and between side guide plates 12 on stand 13 to a pair of pinch rolls 15 mounted on stand 16 and driven by a motor 17. The stock 10 then passes to the slitter head indicated generally at 20 which is shown as mounted on a main base 22 closely adjacent the supporting stand 16 for the pinch rolls 15. The main base 22 includes a portion 23 which supports a scrap cutter 25 for cutting the strips of scrap trimmed from the side edges of the web 10 in the slitter head 22, and the scrap cutter 25 is provided with its own drive motor 26, reference being made in this connection to my copending application Serial No. 444,776 filed July 21, 1954, and assigned to the same assignee as this application. The good strips of stock pass across the scrap cutter 25 and are guided on by way of the exit roll 27 thereon.

The slitter head 20 is shown in detail in Figs. 3 and 4–6. It includes a sub base 30 on which is mounted a pair of arbors 31 and 32, each carrying a plurality of slitting knives or cutters 33 alternating with spacer collars 34. One end of each of the arbors is supported in a housing 35 fixed on the sub base 30. The other ends of the arbors are journalled in a housing 36 supported for movement lengthwise of sub base 30 in order to release the ends of the arbors for removal and rearrangement of the knives and spacer collars thereon.

Referring particularly to Figs. 4–6, the sub base 30 has a V-rail portion 40 on its upper surface mating with a V-groove 41 in the under side of housing 36 to provide for guided slitting movement of the housing on the sub base. A gib 42 is carried by a locking stud 43 depending from housing 36, and this gib slides in a slot 44 in the upper surface of the sub base 30, the slot and gib having beveled side edges for frictional locking when the stud 43 is tightened in its locking nut 45 by the handle 46. When stud 43 is released, movement of housing 36 is effected by a screw 50 mounted in the end wall of sub

base 30 and having a crank handle 51 and a connection 52 with the housing 36. The movement of these parts should be such, as indicated in Fig. 5, to free the adjacent ends of both arbors 31 and 32 for ready replacement of the cutters and spacer collars thereon.

The slitter head 20 is removable and replaceable as a unit with respect to the main base 22, and means are provided for quickly and accurately indexing a selected slitter head in the slitting line. The upper surface of the main base 22 is provided with V-rails 60 and pads 61 which mate with complementary V-grooves 62 and pads 63 on the under surface of the sub base 30. Thus mounting of the sub base on the main base with these rails and grooves in engagement assures correct parallel alignment of the arbors 31 and 32 at right angles to the desired path of the web 10 through the slitter.

Additional means are provided for quickly and easily centering the slitter head 20 with respect to the slitting line. Referring to Fig. 4, a stop bar 65 is fixed on the upper surface of the main base 22 adjacent one end thereof, and a fluid pressure cylinder 66 is mounted on the upper surface of base 22 adjacent this stop 65. When the slitter head is mounted on base 22, the sub base 30 is received over cylinder 66 so that the piston rod 67 can be moved against the inner surface of end wall 68 of the sub base which is adjacent stop 65. This will in turn move the slitter head as a unit along the rails and pads 60 and 61 until the outside of the end wall 68 engages the stop 65 to establish the correct centered position of the slitter head in the line.

Releasable means are provided for quickly securing the slitter head 20 in this aligned and centered position. Adjacent the stop 65 on the upper surface of the main base 22 is a pair of locking bolts 70 pivoted in a bracket 71 and adapted to fit within complementary forked portions of a bracket 72 on the adjacent end of the sub base 30. The upper ends of the bolts 70 carry nuts 73 adapted to be tightened against the bracket 72 to lock this end of the sub base 30 to the main base 22. Similar locking bolts 75 are mounted in brackets 76 on opposite sides of the main base adjacent the other end of the sub base and cooperate with forked brackets 77 on the sides of the sub base and nuts 78 to assure maintained positioning of the slitter head in aligned and centered relation with the slitting line.

It is common practice in a slitting and coiling line to pull the stock through the slitter by means of a driven rewind unit, but the invention also provides a quickly releasable drive for the arbors 31 and 32. Referring to Fig. 1, a drive motor 80 and gear box 81 are mounted on a fixed base 82 secured at 83 to the main base 22. The gear box 81 includes twin drive shafts 85 adapted for driving connection with the arbors 31 and 32 through overrunning clutches 86 and quickly detachable couplings 88. Each of these couplings includes a knuckle 90 connected with its associated clutch 86 and a knuckle 91 connected with its associated arbor, and these knuckles include splined stub shafts 92 and 93 adapted to be received in opposite ends of a complementary splined collar 95. A centering bolt 96 in the collar 95 prevents removal of the collar, and when this bolt is removed, the collar 95 will quickly slide along one or the other of shafts 92 and 93 to permit removal of the other shaft therefrom.

The invention accordingly makes it possible to set up and adjust the knives on the slitter head 20 while the head is out of the slitting line and the line is running with another slitter head. In order to facilitate this operation, and also protect the bearing surfaces on the under side of the sub base 30, a jig base 100 is provided as shown in Fig. 3 for supporting the slitter head while it is off the main base 22, the upper surface of the jig base 100 having V-rails 101 and pads 102 corresponding to the parts 60 and 61 on the main base. While the slitter head is thus mounted on the jig base, the housing 36 may be backed off as described to free the ends of the arbors 31 and 32 for resetting and replacement of the cutters thereon without interruption in operation of the slitting line, and also with the slitter head away from the other equipment in the line rather than trying to work across such other equipment as is necessary if resetting of the cutters is carried out with the slitter head installed in its operating position in the line.

Thereafter when the output of the line is to be changed, it is only necessary to release the couplings 88 and the lock bolts 70 and 75 and then to lift out the complete slitter head by a crane and to replace it by another slitter head on which the knives have already been properly set for the next slitting run, and the housings 35 and 36 are accordingly provided with means such as the eye bolt 105 for connection with the crane. As this new slitter head is lowered onto the main base 22, it is simple for the operator to guide it into the proper position for engagement of the V-grooves 62 and the V-rails 60 and thus to set the head in parallelism with the other equipment in the line. Then pressure is applied in the cylinder 66 to move the sub base 30 against the stop 65 as described and thus to center the slitter head in the line, after which it is locked in place by the bolts 70 and 75 and the arbors 31 and 32 are connected to the drive by the couplings 88.

As soon as the new slitter head is thus ready for operation, the sheet 10 is fed thereto by means of the driven pinch rolls 15, and the drive for the arbors is started to inch the sheet through the slitter head to the rewind station. For example, satisfactory results have been obtained with an inching speed for the stock of the order 50 feet per minute as compared with running speeds varying from 100 to 2500 feet per minute depending upon the nature of the stock. As the normal drive speed is reached, the direct drive to the arbors is overrun through the clutches 86, and the drive motor 80 may then be shut off if desired, but if the slit sheet is to be sheared rather than rewound, the drive may be continued by the motor 80.

As a practical illustration of the advantages of the present invention, it has been found that when the slitting line includes a fixed slitter requiring resetting in place, the unproductive down time of the line as a whole will ordinarily range from one or two as high as four hours, depending upon the complexity of the required resetting of the knives, and this time represents dead loss in terms of both manpower and expensive equipment. In contrast, it has been found that the total time required for such change of the slitter line output in accordance with the present invention averages closer to twelve minutes and has been accomplished in as little as seven minutes. Thus the efficiency and output of the entire slitting line is greatly increased with relatively small increase in the initial cost, since it is apparent that a plant operating more than one slitting line can under many conditions obtain all these advantages by the addition of a single extra slitter head for interchangeable use on all of its lines.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A slitter assembly adapted for quick removal and replacement from above in a slitting line for sheet metal stock, comprising an elongated main base for mounting in fixed transverse relation with the slitting line, an elongated substantially rigid sub base, slitting means on said sub base, complementary guide means on the top of said main base and the bottom of said sub base extending longitudinally of said bases and engageable with each other by relative vertical movement to maintain said bases in accurate alignment, a fluid pressure cylinder on said

main base adapted to be received within the under side of said sub base and including a movable piston rod, means within said sub base for engagement with said piston rod upon downward movement of said sub base onto said main base to effect sliding adjusting movement of said sub base on said main base in response to application of fluid pressure in said cylinder, and a stop on said main base located in predetermined spaced relation with said cylinder to establish a limit position of adjustment of said sub base on said main base.

2. A slitter assembly adapted for quick removal and replacement from above in a slitting line for sheet metal stock, comprising an elongated main base for mounting in fixed transverse relation with the slitting line, an elongated substantially rigid sub base, a fixed housing mounted adjacent one end of said sub base, cooperating slitting arbors each supported at one end with said fixed housing and adapted to receive a plurality of slitting knives thereon in adjustable relation, a second housing for receiving and supporting the other ends of said arbors, means mounting said second housing on said sub base for guided movement into and out of supporting relation with said arbors to provide for removal and replacement

of the slitting knives on said arbors, complementary guide means on the top of said main base and the bottom of said sub base extending longitudinally of said bases and engageable with each other by relative vertical movement to maintain said bases in accurate alignment, a fluid pressure cylinder on said main base adapted to be received within the under side of said sub base and including a movable piston rod, means within said sub base for engagement with said piston rod upon downward movement of said sub base onto said main base to effect sliding adjustment movement of said sub base on said main base in response to application of fluid pressure in said cylinder, and a stop on said main base located in predetermined spaced relation with said cylinder to establish a limit position of adjustment of said sub base on said main base.

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