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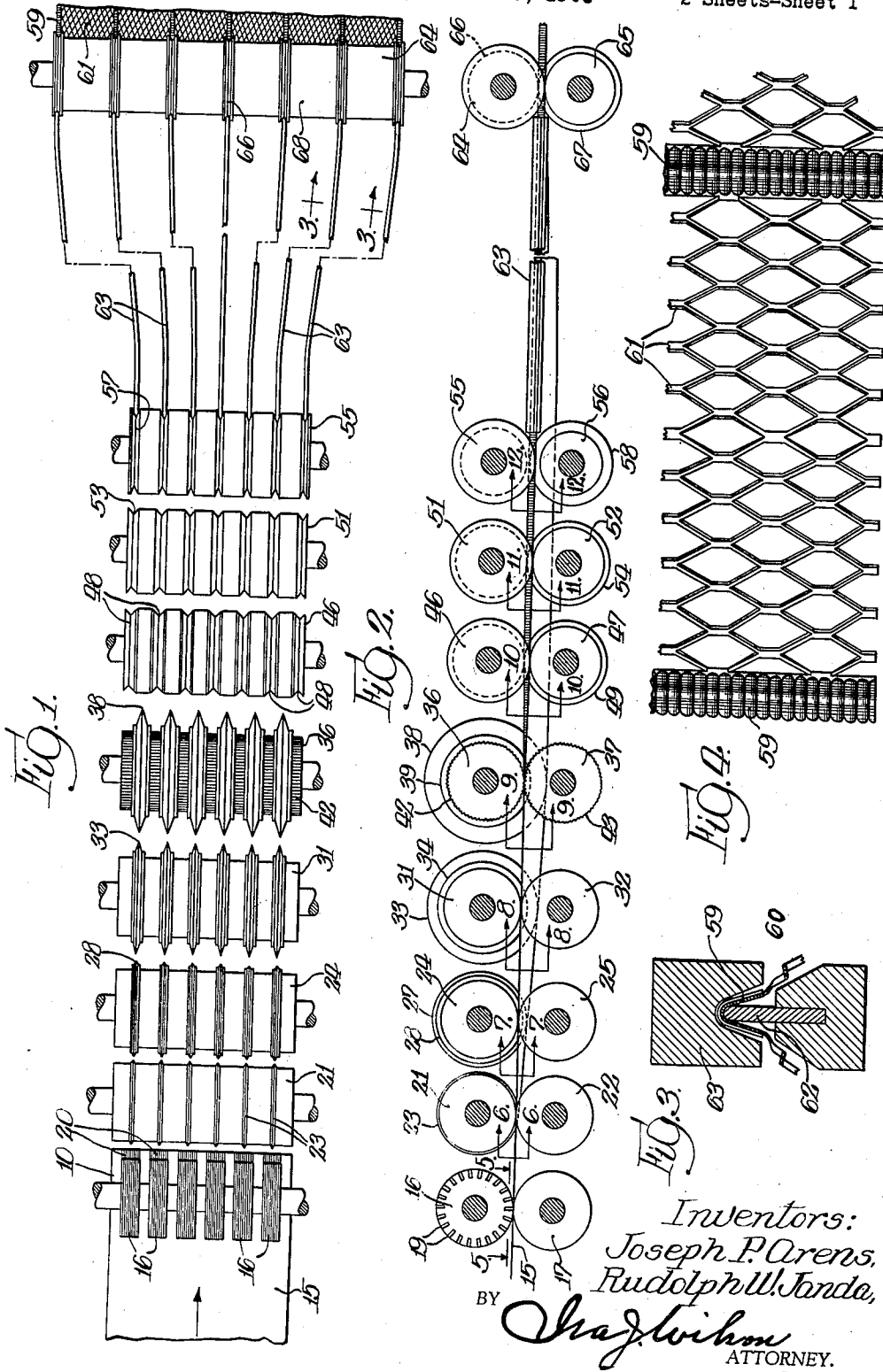
J. P. ARENS ET AL

2,215,658

METHOD OF MAKING EXPANDED METAL PRODUCTS

Filed March 28, 1940

2 Sheets-Sheet 1



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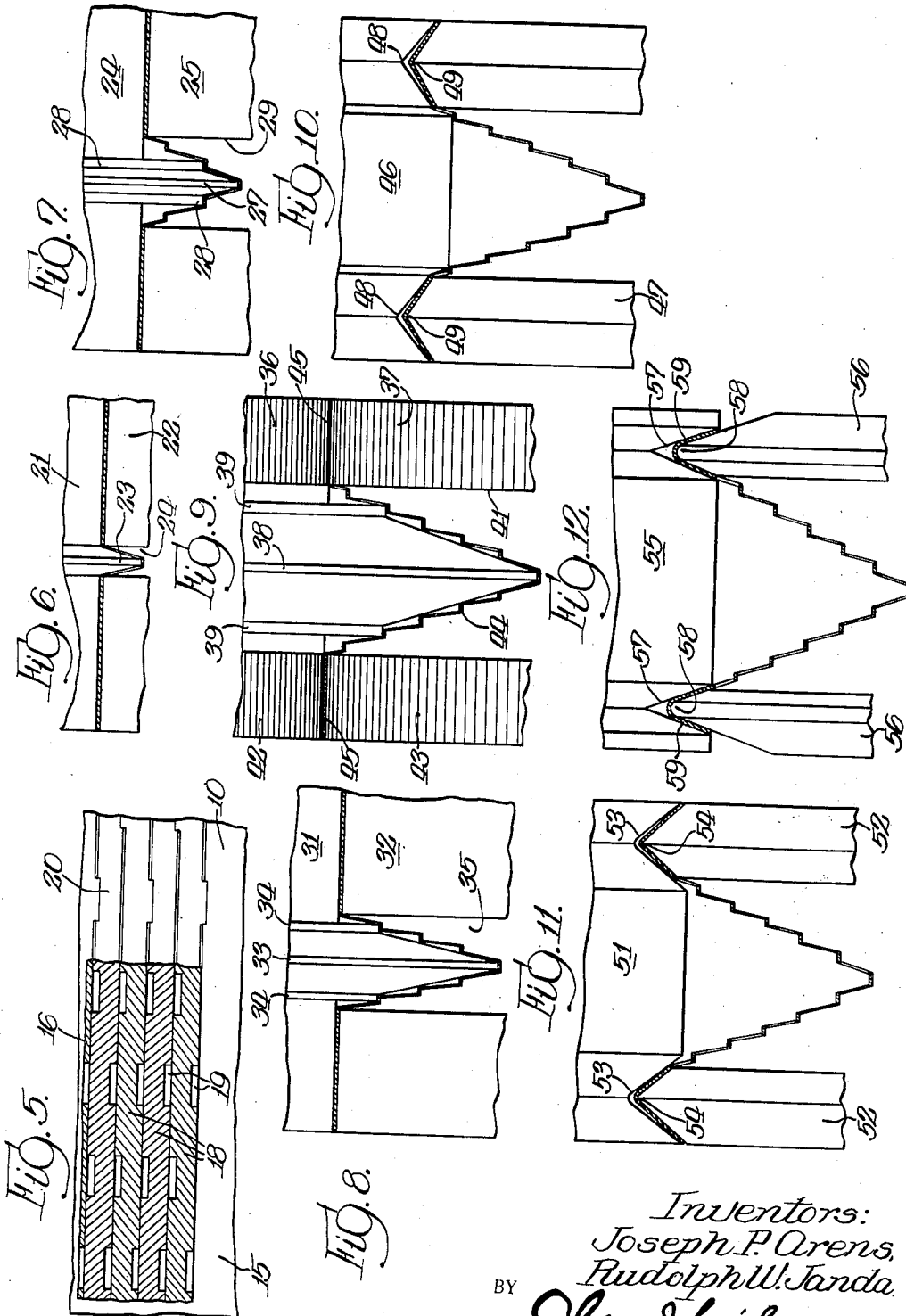
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METHOD OF MAKING EXPANDED METAL PRODUCTS

Filed March 28, 1940

2 Sheets-Sheet 2



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2,215,658

METHOD OF MAKING EXPANDED METAL PRODUCTS

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Application March 28, 1940, Serial No. 326,358

4 Claims. (Cl. 164—6.6)

This invention relates to the manufacture of sheet metal products and more specifically to a reinforced, expanded metal product and a method of making the same.

Expanded metal products employed in building constructions as lathing and in other structures for concrete reinforcement purposes have heretofore been reinforced by spot welding to one or both faces of the expanded web reinforcing rods, wires or fabricated ribs. In some instances, also, where the meshes are of special shape which do not, upon expansion, reduce the length of the fabricated web, reinforcing ribs have been formed integrally with the reticulated or expanded metal webs.

Standard expanded metal products, however, with which our invention is concerned, comprise diamond shaped meshes formed by laterally expanding a series of staggered slits. The mesh openings, as they are laterally expanded, are by the same action longitudinally contracted, with the result that the ultimate length of the expanded metal webs is considerably less than the length of the original metal sheet from which they were formed.

As the result of this reduction in length, reinforcing ribs integral with the expanded metal webs could not be produced, because the length of the ribs exceeded that of the expanded webs. Consequently, the webs would be torn from the ribs during the expanding operation.

One of the primary purposes of our present invention is to provide an expanded metal product having standard diamond shaped meshes and reinforced by strengthening ribs alternating with and formed integrally with the expanded metal webs. In order to accomplish this result without rupturing or weakening the metal at the juncture of the ribs and expanded webs, our invention contemplates reducing the length of the ribs during the expansion of the webs commensurately with the reduction in length of the webs so that excessive strains are not imposed upon the metal, and the completed product consists of alternately disposed and integrally united, expanded webs and strengthening ribs of equal length.

Further advantage in the completed product is attained by this reduction in length of the strengthening ribs in that the shortening of the ribs, which is brought about by transversely corrugating them, also strengthens the ribs so that the finished product incorporating the corrugated ribs is considerably stronger and affords greater resistance against deformation than a product embodying plain ribs, whether formed integrally

with or applied to the expanded metal web or sheet.

A further advantage inherent in our novel product and method resides in the fact that the product may be manufactured in a continuous and uninterrupted process in which the metal sheets are fed in at one end of the machine, travel uninterruptedly through the machine, and emerge at the opposite end as the completed product. This method of continuous movement of the sheet through the machine, while being subjected to the various requisite operations, tends not only to uniformity and excellence of product, but also to rapidity and economy in manufacture.

For the purpose of facilitating an understanding of our invention and the principles involved therein, we have illustrated on the accompanying drawings a fragment of the product itself and a somewhat diagrammatic showing of the method employed in its production, from an inspection of which, when considered in connection with the following description, our invention and its advantageous features should be appreciated.

Referring to the drawings:

Fig. 1 is a plan view somewhat diagrammatic in character of an apparatus capable of carrying into practice our novel method;

Fig. 2 is a side view thereof;

Fig. 3 is a sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary plan view of our novel product;

Fig. 5 is a sectional view on the line 5—5 of Fig. 2; and

Figs. 6 to 12, inclusive, are fragmentary sectional views taken on the planes of the lines 6—6, 7—7, 8—8, 9—9, 10—10, 11—11 and 12—12 of Fig. 2.

In the production of our expanded metal product, in accordance with our novel method, a sheet of metal of the desired gauge and of suitable dimensions is first subjected to the action of a pair of companion rolls **16** and **17** (Fig. 1) by which spaced apart portions or areas of the sheet are provided with longitudinally disposed slits arranged in staggered relation. The rolls **16** and **17**, as will be apparent from Fig. 1, are fixed in spaced relation upon parallel shafts, one or both of which is power driven. Each roll comprises a plurality of disks **18** disposed in contiguous relation and alternating in size so as to present cutting edges alternating with non-cutting recesses **19**. The larger disks of roll **16** align with the smaller disks of roll **17**, while the smaller disks of roll **16** align with the larger disks of roll **17**. When

the metal sheet is passed between these rolls, it is cut thereby to provide a series of parallel, longitudinally extending rows of slits, the slits of each row being separated by uncut portions of the length of the recesses 19 and the slits in adjacent rows being disposed in staggered relation. The slitting of sheet metal by cutting rolls in a continuous operation being well known in this art, further detailed explanation of the slitting apparatus is believed to be unnecessary.

From Fig. 1 it will be apparent that after passing the slitting rolls, the sheet comprises a series of longitudinally extended slitted portions or areas 20 disposed transversely of the sheet in alternation with flat unslitted portions or areas 10. The sheet is next passed between a pair of rolls 21 and 22 of which roll 21 is provided with a plurality of circumferentially projecting beads or ribs 23 arranged to engage the central portion of each slitted area of the sheet to depress said portion into a groove 24 formed in roll 22, as illustrated in Fig. 6, thereby expanding the central slits of the slitted areas into meshes, as illustrated in Fig. 6.

The sheet then proceeds between the rolls 24 and 25, which are respectively provided with the ribs 27 and 28 and the wider groove 29 to expand additional slits of the slitted portions, as illustrated in Fig. 7.

Thereupon the sheet passes between rolls 31 and 32, the former of which carries the ribs 33 and 34 to further project the material into groove 35 of roll 32 to form additional meshes, as illustrated in Fig. 8.

From these rolls the sheet, the slitted portions of which are now partially expanded, passes between rolls 36 and 37. Roll 36 is equipped with the ribs 38 and 39 to expand the slits into additional meshes, and roll 37 is provided with a groove 41 of sufficient width to receive the expanded metal, as illustrated in Fig. 9. This being the last expanding operation for slitted sheet areas of the width exemplified herein, it will be apparent that this last expanding operation would rupture or at least stretch and weaken the meshes attached to the uncut portions 10 of the sheet, because during the lateral expansion of the slits into meshes, the length thereof has been materially reduced by the action of the expanding rolls. Therefore, at the last expansion stage produced by rolls 36 and 37, the length of the uncut portions 10 is reduced to that of the slitted and expanded portions. This reduction in length of the uncut portions 10 is accomplished by circumferentially disposed rounded teeth 42 on roll 36 intermeshing with companion teeth 43 on roll 37 so as to transversely corrugate the unslitted portions 10 and thereby reduce their length to that of the expanded portions. The last draw or expansion adjacent each unslitted portion may therefore be performed without producing destructive stresses upon the side meshes of each expanded portion.

At this stage the sheet comprises a plurality of downwardly folded, laterally expanded portions 44 alternating with flat, transversely corrugated portions 45, the expanded and the corrugated portions being of the same length so that no undue strains have been imposed upon the meshes connected with the corrugated portions.

In this condition, the partial fabricated material is passed between a pair of rolls 46 and 47, roll 46 of which is provided with a plurality of circumferential grooves 48 aligned with the corrugated uncut portions of the material and co-

operating with circumferentially projecting ribs 49 on roll 47 to longitudinally bend the corrugated portion into shallow V-shape, as illustrated in Fig. 10.

The material is next passed between companion rolls 51 and 52 provided respectively with grooves 53 and ribs 54 to effect a further bending of the corrugated portions, and finally the material passes between similar rolls 55 and 56 provided respectively with the sharper grooves 57 and ribs 58 by which the corrugated portions are caused to assume the V-shape illustrated in Fig. 12 and form reinforcing ribs 59 for the product.

The downwardly folded expanded portions of the material are now restored substantially to a common plane by separating or spreading apart the corrugated reinforcing ribs 59. This is done by passing the reinforcing ribs between diverging guides 60, each comprising a lower rib guide member 62 beneath its respective corrugated rib 59 and an upper companion grooved guide member 63, all as illustrated in Fig. 3. These guides fan out or diverge from their receiving to their delivery ends, as indicated in Fig. 1, so that when the material reaches the delivery ends of the guides the expanded portions thereof have been pulled upwardly by separation of the reinforcing ribs 59 into a substantially common plane. To complete the positioning of the expanded metal portions into a common plane, the material is now passed between a pair of rolls 64 and 65 provided respectively with grooves 66 and ribs 67 to receive and bring into a common plane the ribs 59, and also provided with intervening flat portions 68 between which the expanded portions of the material pass and by which these portions are flattened and all brought into a common plane.

The product, therefore, when delivered consists of a series of spaced apart, longitudinally extending corrugated strengthening ribs 59 alternating with webs 61 of expanded metal, consisting of standard diamond shaped meshes. The overall width of the product is considerably greater than the width of the original sheet, while the length of the product both with respect to the expanded metal web portions and the corrugated strengthening rib portions is somewhat less than the length of the original sheet. The lengths, however, of the expanded portions and the intervening strengthening ribs are substantially equal so that no undue strain is at any time imposed upon the meshes connected with the ribs, and the ribs themselves being corrugated are thereby increased in strength and add to the strength and rigidity of the product.

The structural details of both the product and the method herein disclosed may obviously be varied within considerable limits within the scope of the appended claims. For instance, the number of successive operations required to produce the expanded web portions will be dependent to some extent upon the width of such portions desired, and the shape and number of the rolls for forming the strengthening ribs will be determined by the size and shape of the strengthening ribs desired.

We claim:

1. The method of producing expanded metal articles having longitudinally disposed strengthening ribs which comprises providing spaced apart areas of a metal sheet with parallel slits arranged in staggered relation, applying pressure to said slitted areas, first centrally between and

then successively toward the unslitted areas to transversely expand and longitudinally contract said slits thereby forming expanded metal webs, corrugating the metal of the unslitted areas there-
 5 by reducing the length thereof to the length of the expanded areas, forming said unslitted areas into ribs, and flattening said expanded areas into flat, reticulated webs interposed between adjacent ribs.

10 2. The method of forming a reenforced, expanded metal article from a metal sheet, which consists in slitting said sheet longitudinally at intervals to provide longitudinally extending un-
 15 slitted areas alternating with areas having slits disposed in staggered relation, expanding the slits of said slitted areas into diamond shaped meshes by forcing the central portion of each
 20 slitted area transversely from the plane of the original sheet, corrugating said unslitted areas, bending said corrugated areas into rib formations, and restoring the expanded areas to a common
 25 plane, thereby providing flat, reticulated webs shorter than the length of the original sheet alternating with corrugated strengthening ribs corresponding in length with the webs.

3. The method of producing a reenforced, ex-

panded metal product, which consists in longi-
 tudinally slitting transversely spaced apart por-
 tions of a metal sheet so as to provide said por-
 tions with slits arranged in staggered relation,
 5 projecting said slitted portions by successive stages away from the plane of the original sheet to transversely expand the slits into meshes,
 transversely corrugating the intervening unslitted
 portions of said sheet, and restoring the expanded
 portions to a common plane. 10

4. The method of producing a reenforced ex-
 15 panded metal product which consists in providing transversely spaced apart portions of a metal sheet with a plurality of rows of separated slits,
 said slits being arranged in staggered relation, 15 stretching said slitted portions in successive stages by depressing the centers of said portions to ex-
 pand the slits into diamond-shaped meshes, de-
 forming the metal of the unslitted portions of
 the sheet to reduce the length thereof to that of 20 the intervening expanded portions, forming said corrugated portions into ribs, and flattening the product.

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