May 30, 1950 E. MAYER 2,510,024

MEANS FOR CORRUGATING METAL SHEETS

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Fig. 1

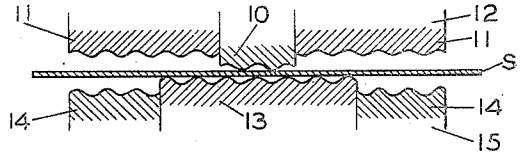


Fig. 2

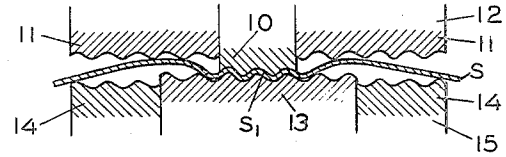


Fig. 3

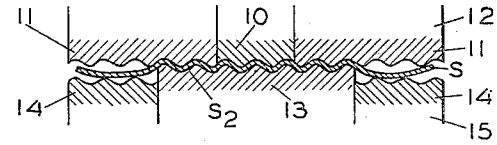


Fig. 4

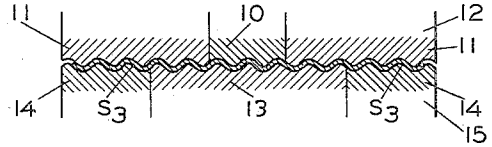


Fig. 5

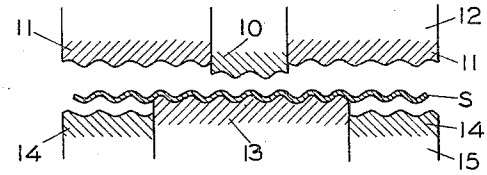
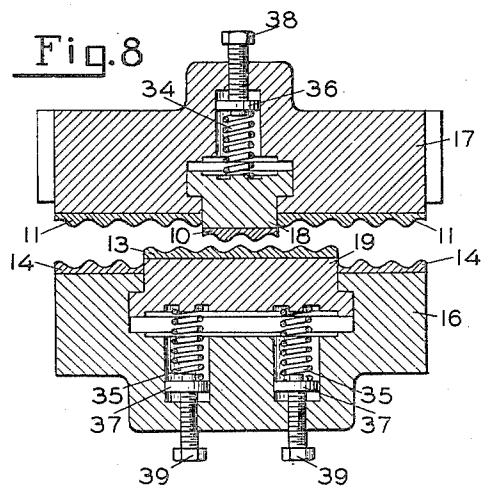


Fig. 8



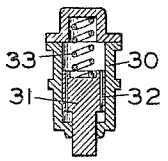


Fig. 7

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MEANS FOR CORRUGATING METAL SHEETS

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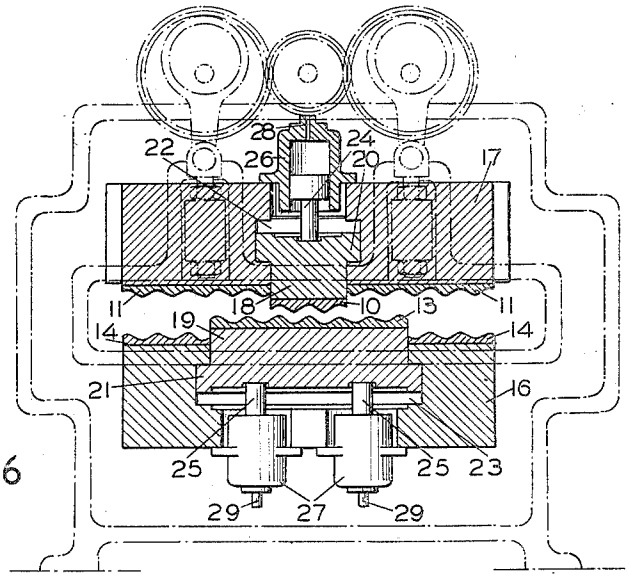

Fig. 6

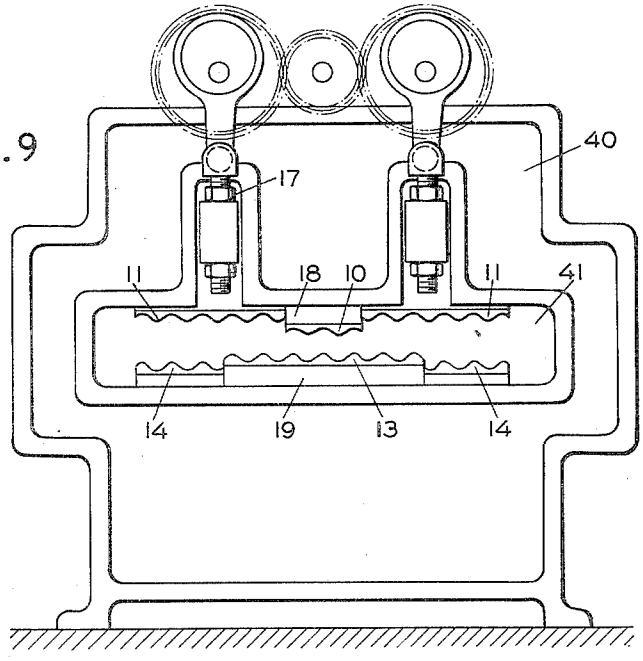

Fig. 9

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MEANS FOR CORRUGATING METAL SHEETS

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In France March 27, 1940

3 Claims. (Cl. 153—76)

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According to a conventional method, the corrugations are formed in a sheet, one after another, by means of a stamp in the form of a blade, adapted to form one corrugation only, and co-operating with a corrugated die-bed. With this method it is necessary to move the sheet across the die-bed in a stepwise fashion in order to provide corrugations across the whole sheet, as only one corrugation can be obtained at a time with the afore-described tools. This is a tedious and therefore not very satisfactory method. It has also been proposed to provide a corrugating machine of the type described with independently movable holding blocks for retaining the corrugated parts of a sheet in position on the die-bed.

Another form of a corrugating machine comprised a corrugated die-bed and a series of separate, independently movable and spring-controlled blades co-operating with the die-bed, for forming the corrugations. In this machine, however, the sheet was not positively gripped across its entire width, but only at individual points, so that an even and correct formation of the corrugations was not ensured. Furthermore, the blades were not easily interchangeable, so that the machine could only be employed for making one type and size of corrugations, and, lastly, in view of the great number of individually operated blades, adjustment of the machine was complicated and maintenance difficult.

It is an object of the present invention to provide a machine suitable for carrying out the improved method.

According to the invention, the formation of corrugations progresses in steps from the centre of the sheets towards their ends, the sheets being acted upon from both sides by sectional dies, the die sections having continuous profiles and being successively brought into action on the sheets during one operation. In this manner, a plurality of corrugations is formed in each step and the sheets are gripped positively at either side during the whole operation. The method according to the invention is applicable to sheets both of low and of high tensile strength.

The invention consists of a machine for making corrugated metal sheets, comprising sectional upper and lower dies, the die sections having each a continuous profile and being adapted to act progressively on a sheet, the centre sections of the dies being projected against the sheet in advance of the end sections.

Preferably, corresponding die sections on the upper and lower dies should be of different width, so that the zones of contact between the sheet and the upper and lower die sections are not co-extensive. With this arrangement it is possible to carry out a corrugating operation in three

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steps with dies having one movable centre section only.

The centre sections of the dies are normally projected beyond the end sections by elastic means, such as springs or fluid-operated pistons, so that the centre sections will automatically recede to the level of the end sections when the latter are brought into engagement with a sheet.

In the accompanying drawings, the method according to the invention and two embodiments of a machine for carrying out the same are illustrated.

In the drawings:

Figs. 1 to 5 show the various steps of one corrugating operation.

Fig. 6 is a sectional elevation of a machine according to the invention.

Fig. 7 is a detail of this machine.

Fig. 8 is another form of corrugating machine according to the invention.

Fig. 9 is a side elevation of a machine according to Fig. 6.

As will be seen from Figs. 1 to 5, the upper die consists of a central section 10 and end sections 11; the end sections 11 are secured to the upper platen 12, whereas the centre section 10 is adapted, by means to be described later, to slide relatively to the platen 12. The lower die comprises a centre section 13 and two end sections 14 which are secured to the lower platen 15, whilst the centre section 13 is adapted to slide relatively to the platen 15. It will be seen that the lower centre section 13 is of considerably greater width than the upper centre section 10, and that, conversely, the lower end sections 14 are narrower than the upper end sections 11.

In the position shown in Fig. 1, the two platens 12 and 15 are spaced apart with the two centre sections 10 and 13 projecting beyond the end sections. A sheet S, which has been previously straightened, is fed into the machine and supported on the lower centre section 13.

In Fig. 2, the two platens 12 and 15 have been moved towards each other to such an extent that the upper centre section 10 is in engagement with the lower centre section 13, and a centre portion S_1 of the sheet has been corrugated.

In Fig. 3, the two platens 12 and 15 have been further moved together, so that the lower centre section 13 is now in engagement with the upper end sections 11, with the result that the corrugated portion of the sheet now extends laterally into two zones, S_2.

In Fig. 4, the two platens 12 and 15 have been drawn together as nearly as possible, with the result that the end lower sections 14 contact the sheet at the end zones S_3 and effect their corrugations in co-operation with the upper end sections 11.

In Fig. 5, the two platens 12 and 15 are drawn

apart and into the positions which they occupied in Fig. 1, the operation has been completed, the sheet S is provided with corrugations across its entire width, and it now rests on the projected lower centre section 13, from where it can be easily removed.

The embodiment of a corrugating machine according to the invention as shown in Fig. 6 has a stationary lower platen 16 and a movable upper platen 17. The dies are subdivided into central sections 10 and 13 and end sections 11 and 14 respectively. The movable central sections 10 and 13 are mounted on blocks 18 and 19 respectively which have shoulders 20 and 21 respectively movable in cavities 22 and 23 provided in the platens 16 and 17 respectively. In this way, the travel of the blocks 18 and 19 in the cavities 22 and 23 is limited in either direction.

The blocks 18 and 19 are supported on rods 24 and 25 respectively; as the block 18 is comparatively narrow, one rod 24 is sufficient, whilst in the case of the block 19, which has about twice the width of the block 18, two rods 25 are provided. Rods 24 and 25 are slidable in cylinders 26 and 27 into which pressure fluid is admitted through pipes 28 and 29 respectively. The pressure fluid may either be a liquid or compressed air. The pressure of the fluid tends to project the blocks 18 and 19 forward, so that the centre sections 10 and 13 normally project beyond the end sections 11 and 14. When the platens 16 and 17 are drawn together, however, the shoulders 20 and 21 of the blocks 18 and 19 recede into the cavities 22 and 23, displacing the pressure fluid at the same time.

Alternatively, the pressure fluid cylinders 26 and 27 can be replaced by hydraulic recoils as shown in Fig. 7, comprising a closed cylinder 30 filled with a liquid of suitable viscosity, in which a plunger 31 having narrow ducts 32 is displaceable; a spring 33 is arranged between the plunger and the cover of the cylinder.

Upon the approach stroke of the platen 16, the plunger 31 is displaced upwardly in the cylinder 30, compressing at the same time the spring 33 and displacing the liquid on top of the plunger, which slowly passes through the ducts 32 into the lower part of the cylinder 30. As the ducts are very narrow, the movement of the plunger is slowed down considerably. As soon as the platens are drawn apart, the plunger 31 is forced back into its initial position through the spring 33.

In the embodiment of Fig. 8, the blocks 18 and 19 are engaged by springs 34, 35 respectively which slow down the inward movement of the blocks 18 and 19 and act, further, as buffers when the two platens 16 and 17 are drawn apart. The springs 34 and 35 are held in position by means of discs 36, 37 and adjusting screws 38, 39 respectively, threaded into the platens 16 and 17.

Fig. 9 shows a general arrangement of the corrugating machine according to the invention. The machine has two end frames 40 with apertures 41 for feeding a sheet into the space between the sectional dies and for discharging a sheet after the operation has been completed. In practice, the arrangement will be such that straight sheets are fed into the machine at one end and discharged, after corrugation, through the other. This makes it possible to employ the machine in line with other processing apparatus, for instance, straightening machines or galvanising tanks.

I claim:

1. In a machine for corrugating metal sheets, an upper die and a lower die, both dies being movable towards each other, each die consisting of a number of sections arranged in juxtaposition to each other, each die section having a plurality of corrugations on its surface corresponding in shape to those to be formed on a sheet, the centre section of one die being substantially smaller and its outer sections being substantially wider than the corresponding sections of the other die, resilient pressure means acting on both dies for projecting said centre sections in advance of said outer sections, and power means for drawing together in one continuous stroke first the centre sections of both dies and then the outer sections of both dies.

2. In a machine for corrugating metal sheets, an upper die and a lower die, both dies being movable towards each other, each die being subdivided into at least three sections, the lower die consisting of a wide centre section and two narrow outer sections, and the upper die consisting of a narrow centre section and two wide outer sections, each of the sections on both dies having a plurality of corrugations on their surface, said corrugations conforming to those to be produced on a sheet, separate means on both dies for resiliently holding the centre sections in positions in which their corrugated surfaces protrude above the corrugated surfaces of the outer sections, and power means adapted to draw first the two centre sections and then the four outer sections together in one continuous stroke, causing thereby first the narrow centre section and then the wide centre section to recede into positions in which the corrugated surfaces form one continuous line with the corrugated surfaces of the adjoining outer sections.

3. In a machine for corrugating metal sheets having an upper and lower die movable towards each other, each die comprising a platen and centre block, said centre blocks being slidable relative to said platens in the direction of the die movement, said platens and said blocks having each a plurality of corrugations on their surfaces conforming to those to be produced on a sheet, the centre block of one die having substantially greater width than the centre block of the other die, means for holding said blocks in a position in which their corrugated surfaces project past the corrugated surfaces of the platens, and power-operated means for drawing first the blocks and then the platens together in one continuous stroke, whereby the corrugations are formed on a sheet in groups, beginning in the centre and progressing stepwise from the centre to both sides of the sheet.

EUGENE MAYER.

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