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T. SATO
BENDER FOR ROLLED-UP STRIP SUCH AS WINDOW FRAME,
PIPE OR FUEL TANK OF MOTOR VEHICLES

Serial No.
283,285

BY A. P. C.

2 Sheets-Sheet 1

Fig. 1

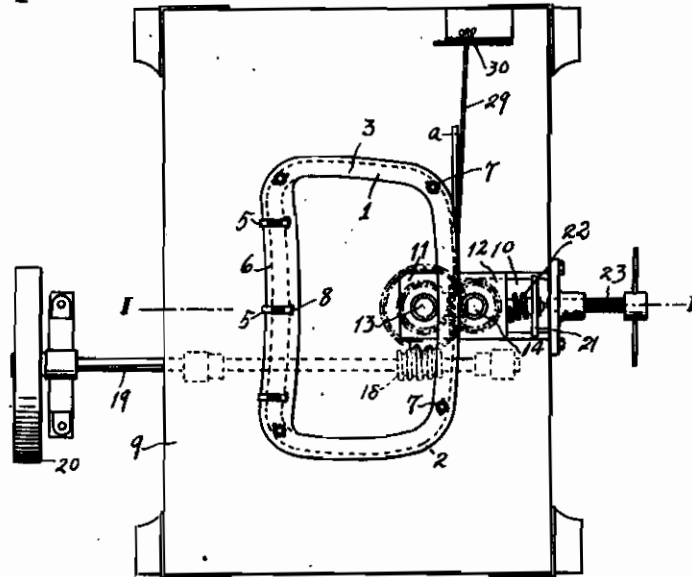


Fig. 3

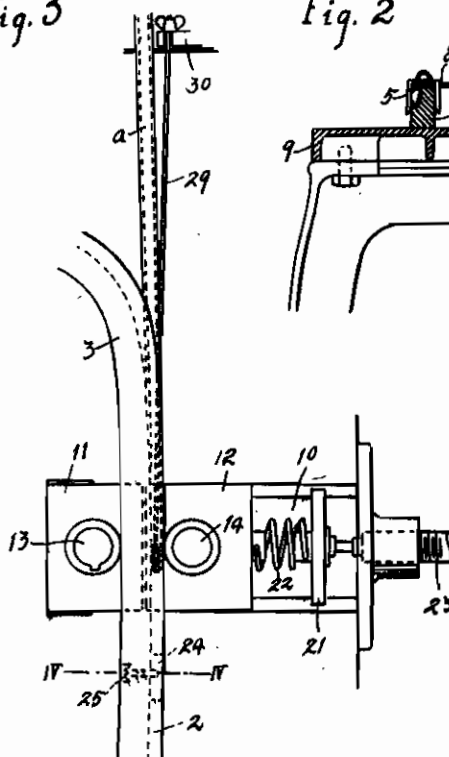


Fig. 2

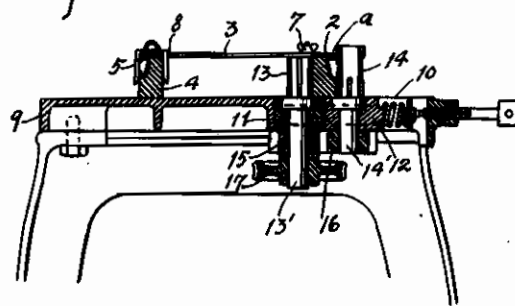
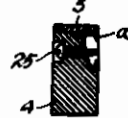


Fig. 4



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2 Sheets-Sheet 2

Fig. 5

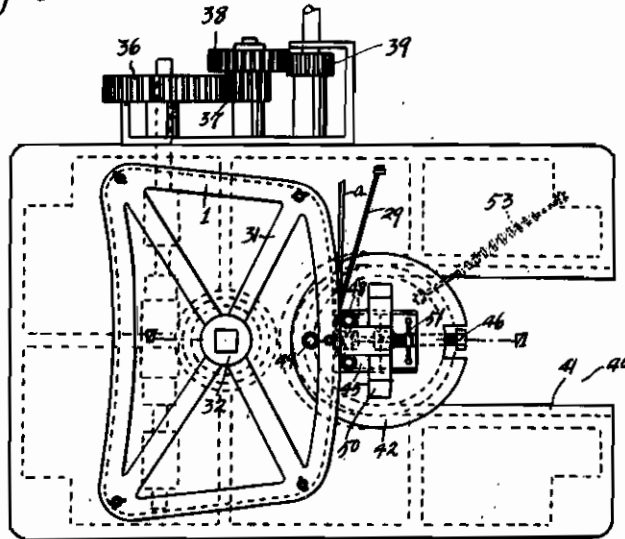


Fig. 6

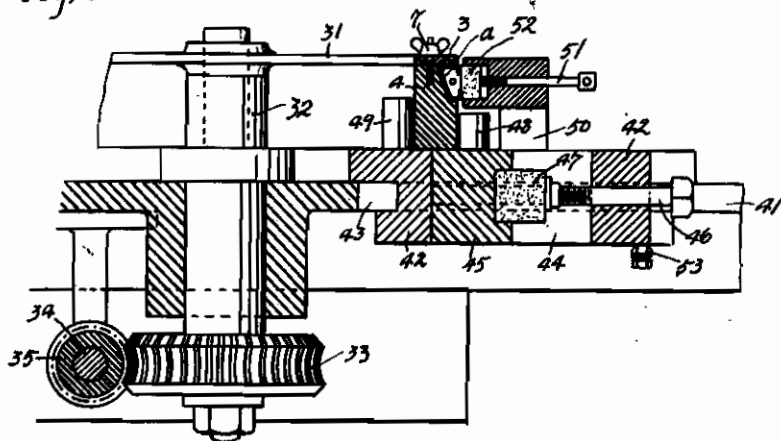


Fig. 7

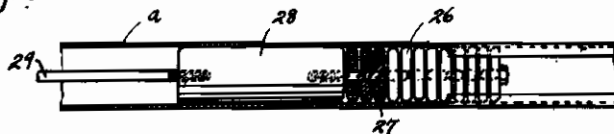
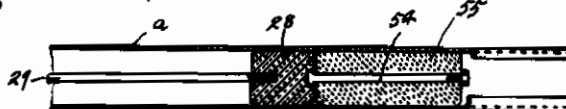


Fig. 8



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BENDER FOR ROLLED-UP STRIP SUCH AS WINDOW FRAME, PIPE OR FUEL TANK OF MOTOR VEHICLES

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vested in the Alien Property Custodian

Application filed July 7, 1939

This invention relates to bender for rolled-up strip, such as window frame, pipe or fuel tank of motor vehicles.

In hitherto apparatus, a frame mould in shape of window frame or windshield is fixed and a rolled-up strip is attached to the frame mould and several pairs of rollers are arranged and moved on the corners of the mould, thus the strip can be bent. Therefore the driving means of these rollers may be complicated.

The object of this invention is to construct the bending apparatus for rolled-up strip forming window frame in which the frame mould is not fixed and it is movable, therefore only one pair of roller is employed. Accordingly, the construction of the bender and its operation is more simple than the hitherto apparatus and the strip can be bent and finished accurately.

The other object of this invention is to construct the window frame, the pipe and the fuel tank etc. whose bending portions have not rumples or stress by employing a special mandrel consisting of many metal pieces or a hard rubber.

This apparatus according to this invention consists of a mould which is formed a frame having uniform width and has a groove to insert the strip to be bent on the outer side, and a pair of roller which contact to the both sides of the mould. Then the mould accompany with the strip is moved between a pair of roller so that the strip may be bent along the mould. And in one embodiment of this invention, the mould is rotated between a pair of roller by the friction of them, while a pair of roller is driven. In another embodiment of this invention, the mould is connected with the rotating shaft by the arm and the rollers are mounted on a sliding disc in such a manner that the rollers may be always contacted with the side surface of the mould by the movement of the sliding disc.

This invention will be described in connection with the accompanying drawings, in which

Fig. 1 is a plan view of one embodiment of this invention.

Fig. 2 is a sectional view, taken on the line II—II of Fig. 2.

Fig. 3 is an enlarged plan view showing one portion of the mould and a pair of roller.

Fig. 4 is a sectional view, taken on the line IV—IV of Fig. 3.

Fig. 5 is a plan view of another embodiment of this invention.

Fig. 6 is an enlarged sectional view, taken on the line VI—VI of Fig. 5.

Fig. 7 is a side view of a mandrel inserted into the strip and one part is shown in section.

Fig. 8 is a sectional view of a modification of the mandrel.

Referring to the drawings, 1 is a frame mould formed of the window frame and consists of an upper member 3 and a lower member 4 secured together by the screw 7. The lower member 4 has the uniform width and has a groove 2 to be inserted a strip *a* on the outer side. 5 are three staples whose one leg is inserted into an aperture 8 perforated on the concave curved side 6 of the upper member 3 of the mould and the other leg is contacted on the outer side of the mould, thus the strip *a* can be moved along the curved side 6 of the mould by these staples 5. 9 is a supporting table which has a rectangular recess 10 on one side and two sliding plates 11 and 12 are slidably fitted into the recess. Two rollers 13 and 14 are rotatably mounted on these sliding plates 11 and 12, and the shafts 13' and 14' of these rollers have pinions 15 and 16 meshed with each other on the lower side of the table 9. The lower end of the shaft 13' of the roller 13 has a worm wheel 17 which meshes with a worm 18 at one end of a driving shaft 19, and this driving shaft is driven by the suitable motor through a pulley 20. The mould 1 is held by two rollers 13 and 14 on its both sides and one of rollers 14 always presses the strip *a* by a spring 22 which is arranged between the sliding plate 12 and a retaining plate 21. This retaining plate is slidably adjusted in the recess 10 by a screw rod 23, thus the pressure of the roller 14 against the mould 1 can be regulated by the rotation of the screw rod. One end of the strip *a* inserted in the groove 2 of the mould is secured to the lower member 4 by means of a screw 25 and a core 24 fitted into the strip *a* as shown in Figs. 3 and 4. A mandrel 26 is inserted into the strip *a* as shown in Fig. 7, said mandrel consisting of several metal pieces whose boundary is the same figure with the section of the strip, and they are jointed with a flexible shaft 27 and spaced each other in small gap. The inner end of the flexible shaft 27 is screwed to a guide mandrel 29 whose boundary coincides with the inner surface of the strip and the outer end of the guide mandrel is connected with a rod 29. The other end of this rod 29 is secured to a suitable bracket 30 on the table 9.

The operation of this apparatus is as follows. When the driving shaft 19 is rotated by the suitable motor through the pulley 20, a pair of roller 13, 14 is rotated through the worm 18, worm wheel

17 and pinions 15, 16, then the mould 1 is moved by the friction with the rollers, therefore the strip *a* in the groove 2 of the mould can be bent in accordance with the curvature of the mould without any rumples or stress by means of the mandrel 26.

In the modification of this invention as shown in Figs. 5 and 6, the mould 1 is rigidly connected with a rotating shaft 32 by the arm 31. The shaft 32 has a worm wheel 33 on the lower side of the table 9 and this worm wheel meshes with a worm 35 of a driving shaft 34 which is driven by any suitable motor through gear wheels 36, 37, 38 and 39. One side of the table, a rectangular opening 48 is formed and a rim 41 is formed on the inner edge of the opening 40. A sliding disc 42 is fitted into the opening and the rim 41 is engaged into a circular groove 43 formed on the outer edge of the sliding disc. This sliding disc is perforated a square hole 44 in which a plate 45 is slidably fitted. 47 is a damping head made of hard rubber secured to the end of a screw rod 46 which is screwed in the sliding disc 42, and the sliding plate 45 is always pressed to the inner edge of the square hole 44 by the damping head. Three rollers 48 are mounted on the sliding plate 45 and a roller 49 is fixed to the sliding disc 42 in opposite position to the rollers 48 in such a manner that these rollers 48 and 49 hold the mandrel 1 between them. A bridge member 58 is mounted on the sliding disc 42 across the hole 44 and a screw rod 51 is screwed into the central portion of the bridge member. This screw rod 51 has a damping head 52 on the inner end, said damping head pressing the strip *a* in the groove 2 of the

mold. 53 is a spring whose one end is fixed to the table 9 and the other end is attached to the sliding disc 42 so that the sliding disc may be always pressed to the direction of the mould although the sliding disc slides outwardly along the opening 40.

Thus, the mould is rotated by the rotating shaft 32 and the sliding disc can be slid sideways along the opening in such a manner that the rollers may be always contacted with the mould, therefore the strip *a* in the groove 2 of the mould can be bent in accordance with the curvature of the mould.

The modification of the mandrel as shown in Fig. 8 consists of a hard rubber mandrel 55 mounted on the flexible shaft 54 and a guide mandrel 28 made of fiber, and this guide mandrel is articulately jointed to the end of the flexible shaft 54.

The bending apparatus according to this invention has the advantage that the construction and treatment is very simple due to the rotation of the mould and the strip can be bent accurately without any rumples or stress on the bending surface by means of the special mandrels.

While I have shown and described two embodiments of this invention, it will be apparent that these embodiments, as well as the detail construction of the several parts, may be varied without departing from the principle of my invention, for example, the mould may be rotated by means of a rack and a pinion without the friction of the rollers as shown in Fig. 1.

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