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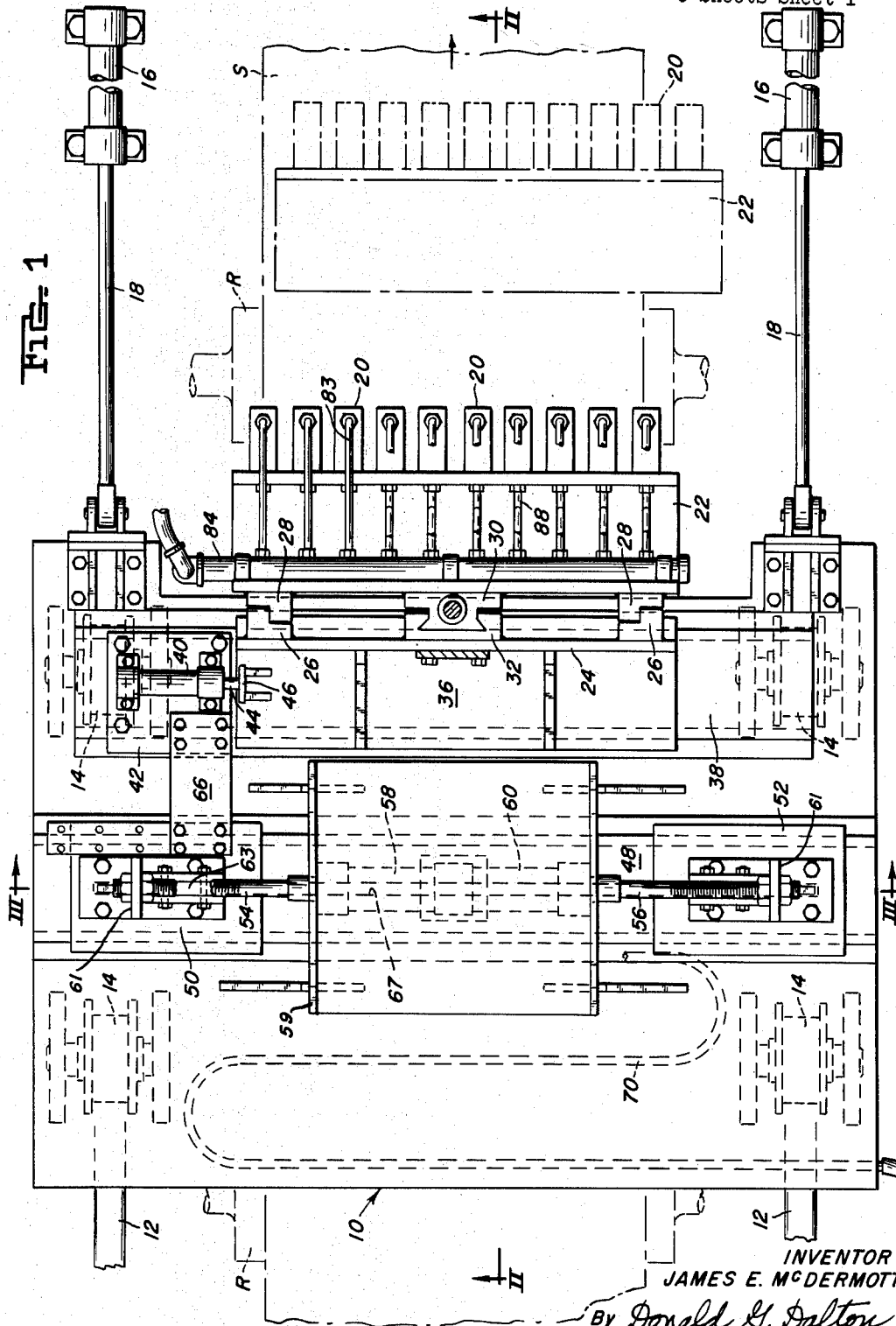
J. E. McDERMOTT

3,227,432

APPARATUS FOR SEVERING TRAVELING PRODUCT

Filed Dec. 5, 1962

3 Sheets-Sheet 1



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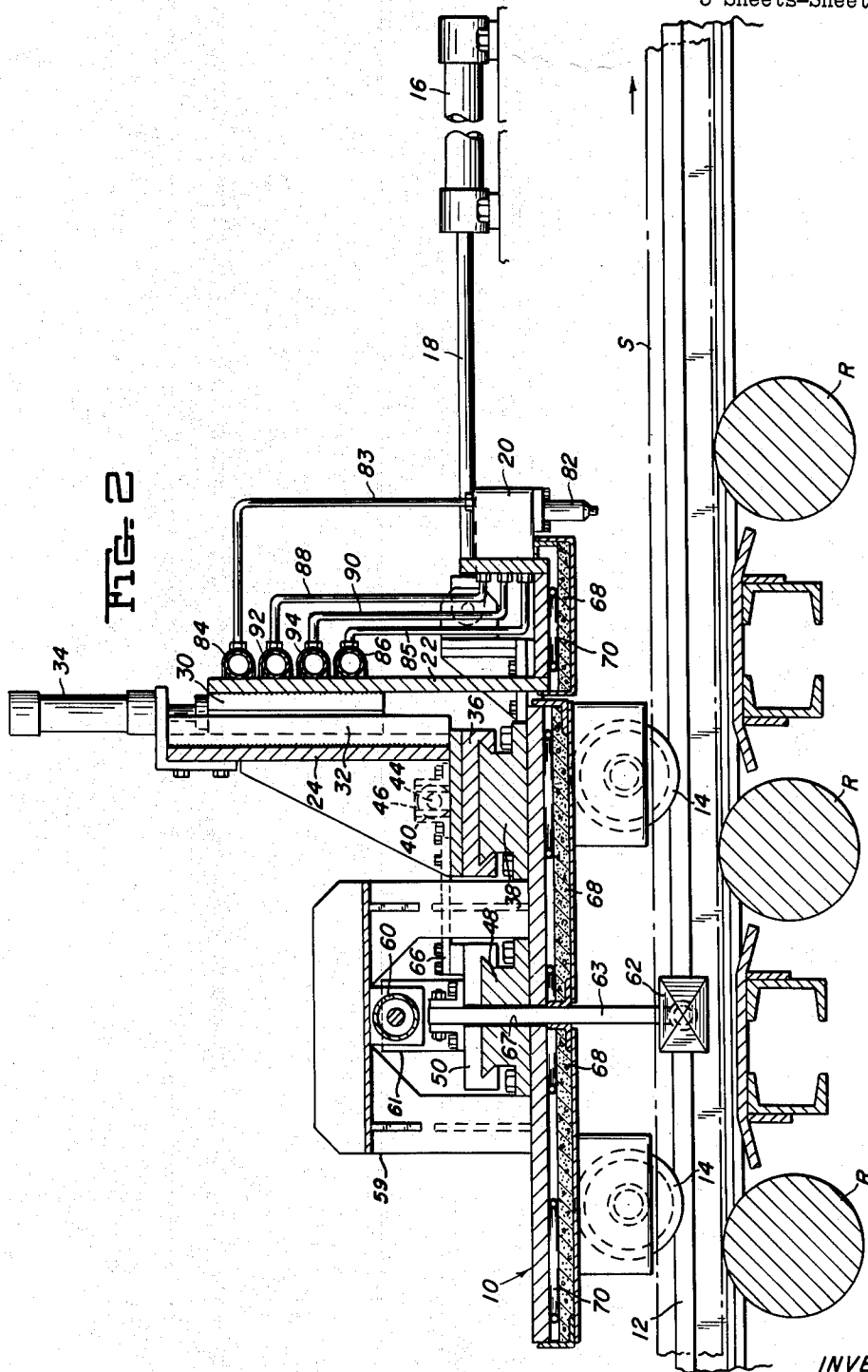
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3 Sheets-Sheet 2



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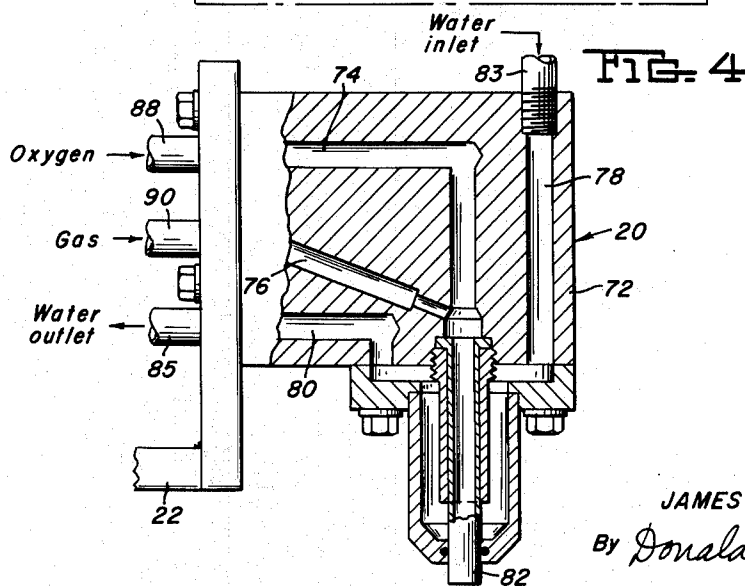
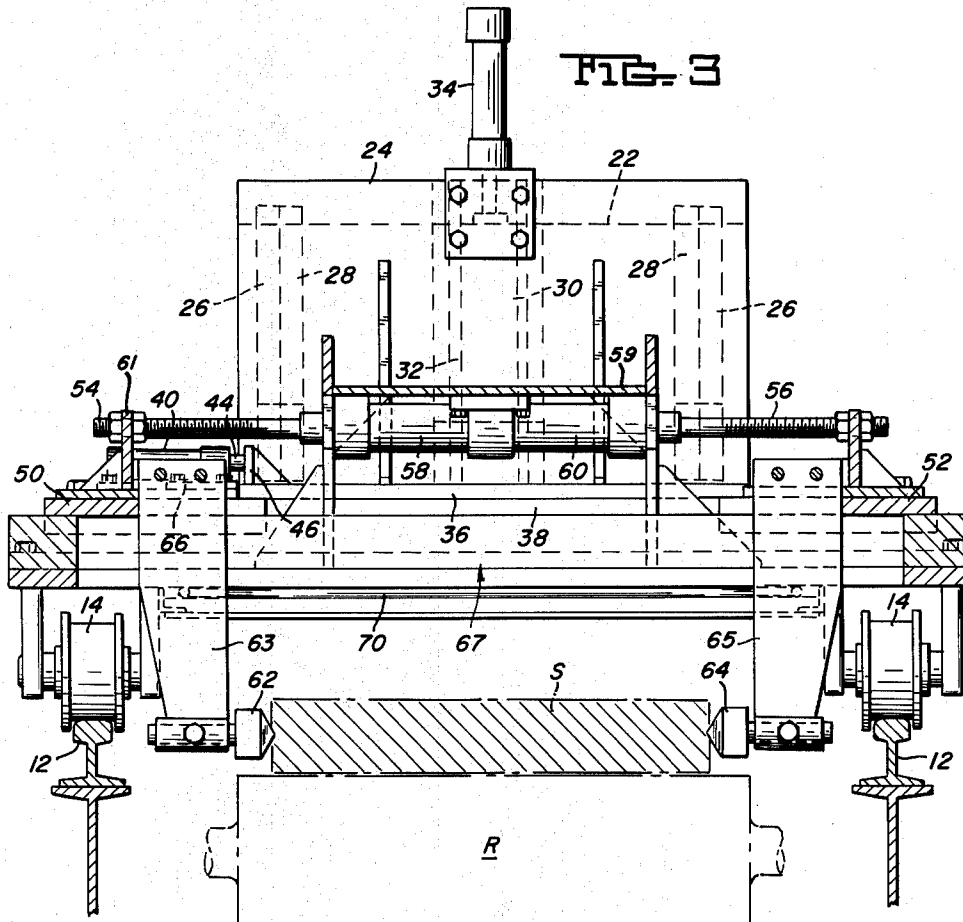
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3 Sheets-Sheet 3



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APPARATUS FOR SEVERING TRAVELING PRODUCT

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4 Claims. (Cl. 266—23)

This invention relates to a cut-off device and, more particularly, to a device employing oxygen torches adapted to sever a relatively thick moving slab of steel.

Continuously cast steel slabs must be severed to convenient lengths for further processing. Inasmuch as the cast steel is continuously withdrawn from the mold, this severing must take place while the slab is moving. In most installations the space available for a cut-off device is very limited, so it is necessary that the severing device quickly sever a slab while traveling a minimum distance therewith. This requirement becomes more critical, of course, as casting speeds increase, thus necessitating quicker cut-off operations.

It is therefore a principal object of this invention to provide a device which will quickly sever a moving slab.

A more particular object of this invention is the provision of a device having a plurality of oxygen cutting torches adapted to quickly sever a moving slab of steel.

Still a further object of this invention is the provision of a device which will move synchronously with a moving slab and, during movement, sever the slab with oxygen cutting torches.

Yet another more particular object of this invention is the provision of a device adapted to travel with the moving slab and provided with a plurality of cutting torches which will first pierce the slab and then move laterally to completely sever it.

These and other objects will be more apparent after referring to the following specification and attached drawings, in which:

FIGURE 1 is a plan view of the device of this invention;

FIGURE 2 is a sectional view taken along line II—II of FIGURE 1;

FIGURE 3 is a sectional view taken along line III—III of FIGURE 1; and

FIGURE 4 is a partial sectional view of one of the oxygen cutting torches of this device.

Referring now to the drawings, the device of this invention is shown in conjunction with a horizontal conveyor having a plurality of rollers R which are adapted to support a continuously moving cast slab S of steel in a horizontal position. The slab may be cast with known equipment, not shown, and brought into a horizontal position where it is continuously fed along the conveyor in the direction designated by the arrows in FIGURES 1 and 2. At this stage in the processing a slab normally will be above the critical temperature although the temperature may vary depending upon the grade of steel, the casting temperature, the thickness and other well known factors. The device of this invention is adapted to sever the moving slab of steel to convenient lengths for further processing.

The device of this invention includes a car or carriage 10 spanning slab S and mounted on rails 12 by means of wheels 14. The rails 12 extend longitudinally on opposite sides of the conveyor and hence support the carriage 10 in a plane parallel to the path of travel of the slab. A pair of hydraulic cylinders 16 are provided, each of which has a piston rod 18 connected to the carriage 10 adapted to drive the carriage back and forth on the rails 12.

The device is provided with a plurality of oxygen cutting torches 20 which will be described in detail present-

ly. The cutting torches 20 are mounted on a J-shaped support bracket 22 and are in alignment transverse to the path of travel of the slab and directed toward the slab for burning.

The J-shaped bracket 22 is slidably mounted on a bracket 24 by two sets of mated gibs 28 and 26 carried by the brackets 22 and 24 and by a slide 30 on the bracket 22 engaging a guide block 32 on the bracket 24. An hydraulic cylinder 34 is mounted on the bracket 24, operatively connected to the support bracket 22 and adapted to move it up and down.

The bracket 24 is provided with a slide 36 which engages way 38 mounted on the carriage 10 transversely of the path of the travel of the slab. The bracket 24 is movable on the way 38 by means of an hydraulic cylinder 40 which is secured to a plate 42 which also is mounted on way 38. The cylinder 40 has a piston rod 44 which is connected to a lug 46 secured to the slide 36.

The carriage 10 is also provided with a second way 48 parallel to the first way 38 on which are mounted a pair of slide members 50 and 52. The slide members 50 and 52 are driven respectively by piston rods 54 and 56 extending from a pair of hydraulic cylinders 58 and 60. These cylinders are carried by a bridge frame 59 secured to the carriage 10. The piston rods are secured to brackets 61 upstanding from members 50 and 52. A slab engaging clamp 62 is mounted on an arm 63 depending from the slide member 50 and a similar clamp 64 is mounted on an arm 65 depending from slide member 52. The arms are movable transversely of the carriage 10 in a slot 67 cut therein. The slide member 50 is connected to the support plate 42 by means of a link plate 66.

Since the slabs to be severed are normally at an elevated temperature, insulating material 68 is provided on the lower surface of the carriage 10 and the torch support bracket 22. Also, additional cooling is provided by means of cooling water tubing 70 located between the insulation 68 and the bottom of carriage 10.

Referring now to FIGURE 4, each torch 20 has a copper body 72 which has an oxygen passage 74, a gas passage 76, a water inlet passage 78 and a water outlet passage 80. A nozzle tip 82 is connected to the oxygen and gas passages and provides a pre-ignition mixture of oxygen and gas for burning through a slab.

Water is supplied to all of the torches through tubes 83 from a main water header 84 mounted on the bracket 22 and the water is removed through tubes 85 to a water discharge pipe 86 also mounted on the bracket 22. Similarly, an oxygen pipe 88 and a gas pipe 90 are mounted on the bracket 22 to supply the oxygen and gas to the torches through tubes 92 and 94 respectively. In the described and illustrated embodiment all of the torches 20 are fed from a common oxygen supply pipe and gas supply pipe. However, it may be desirable for closer control of the flame characteristics of the torches to use two or more separate supply systems for the oxygen and gas so that the pressure loss from one end of the line to the other can be minimized and thereby the flame characteristics more easily controlled. Such a selection can be made readily by one skilled in the art.

When it is desired to sever a moving slab the hydraulic cylinders 16 are actuated to move the device to the far left as seen in FIGURES 1 and 2 and are then actuated to start the carriage moving to the right in the direction of travel of the slab. The flow of oil to the cylinders 16 is regulated so that they will move the carriage at substantially the speed of travel of the slab. Hydraulic cylinders 58 and 60 are then actuated which will drive the clamps 62 and 64 into the edges of the slab as seen in FIGURE 3. This will clamp the carriage 10 to the slab and will cause the carriage to move at exactly the

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speed of the slab. When this clamping has been accomplished oxygen and gas are fed to the torches 20, the supply being controlled to preheat the metal immediately beneath the torches and create a small molten pool whereupon oxygen is supplied to the torches to pierce holes through the slab as will be explained presently.

It should be noted that, when the hydraulic cylinder 58 moves the clamp 62 against the edge of the slab, the slide member 50 also moves inwardly; and since the slide member 50 is connected by link plate 66 to it the support plate 42 also will move inwardly moving the cylinder 40 with it. Since the slide 36 is connected to the piston rod 44, and the cylinder 40 is mounted on the latter, movement of the support plate 42 will move the slide 36 therewith. This movement of the slide 36 is for the purpose of positioning one of the torches (in this case the outermost torch) in alignment with the edge of the slab. With the arrangement described above it is readily apparent that no matter what the position of the slab laterally on the rollers R the outermost torch will move with the clamp 62 and will align vertically above the edge of the slab since the clamp 62 will always move exactly to the edge of the slab.

Simultaneous with clamping, hydraulic cylinder 34 is actuated to lower the bracket 22 to its operating position above the slab. At this position the torches 20 are supplied with gas and oxygen to preheat the slab and, after the molten pool is produced on the preheated slab surface under each torch, cutting oxygen is supplied to the torches to pierce holes in the slab. After the piercing has been completed, hydraulic cylinder 40 is actuated and the slide 36 is moved toward the viewer of FIGURE 1. This movement of the slide 36 traverses the torches laterally and with the supply of cutting oxygen maintained the torches will sever the slab as they are moved. The length of the stroke of the piston rod 44 is determined so that each of the cutting torches 20 will travel one full spacing therebetween to completely sever the slab from each initially pierced hole to the next adjacent one. Because of the required preheating in this particular arrangement, it is necessary that the outermost torch produce a cut at the edge of the slab, while other torches simultaneously pierce the slab, in order to sever the slab between the edge and the first pierced hole.

It should be noted that the preheating, piercing and severing operations are all performed after the clamps 62 and 64 have clamped the carriage 10 to the slab and the carriage is moving along with the slab. The position of the cutting torches 20 after the operation has been completed is shown in chain lines in FIGURE 1.

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After this operation is completed all of the cylinders are reversed which will raise the torches, unclamp the carriage from the slab, return the slide 36 and return the carriage to its initial position ready for another cut.

The sequence of operations of the cylinders may be controlled by hand or a suitable automatic control system may be employed so that the operations will proceed automatically when once initiated.

While one embodiment of my invention has been shown and described it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. Apparatus for transversely severing an elongated workpiece while moving longitudinally, comprising a car spanning the workpiece and adapted to travel along the path thereof, a bracket upstanding from said car, means mounting said bracket for movement transversely of the workpiece, a second bracket slidable vertically on said first-mentioned bracket, a plurality of cutting torches spaced along the second-mentioned bracket directed toward the workpiece, and spaced opposed clamps mounted on said car movable transversely of said path and adapted to grip the edges of the workpiece.

2. Apparatus as defined in claim 1, characterized by tie means connecting said first-mentioned bracket to one of said clamps.

3. Apparatus as defined in claim 1, characterized by a bridge frame on said car and fluid-pressure cylinders mounted on said frame operating said clamps.

4. Apparatus for transversely severing an elongated workpiece while moving longitudinally, comprising a car spanning the workpiece and adapted to travel along the path thereof, a bracket upstanding from said car, means mounting said bracket for movement transversely of the workpiece, a second bracket slidable vertically on said first-mentioned bracket, a plurality of cutting torches spaced along the second-mentioned bracket directed toward the workpiece, fluid-supply manifolds mounted on said second bracket and pipe connections from said manifolds to said torches.

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