Dec. 4, 1956 O. RUTHNER 2,772,523

PLANT FOR PICKLING METALLIC WORKPIECES

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Fig.1

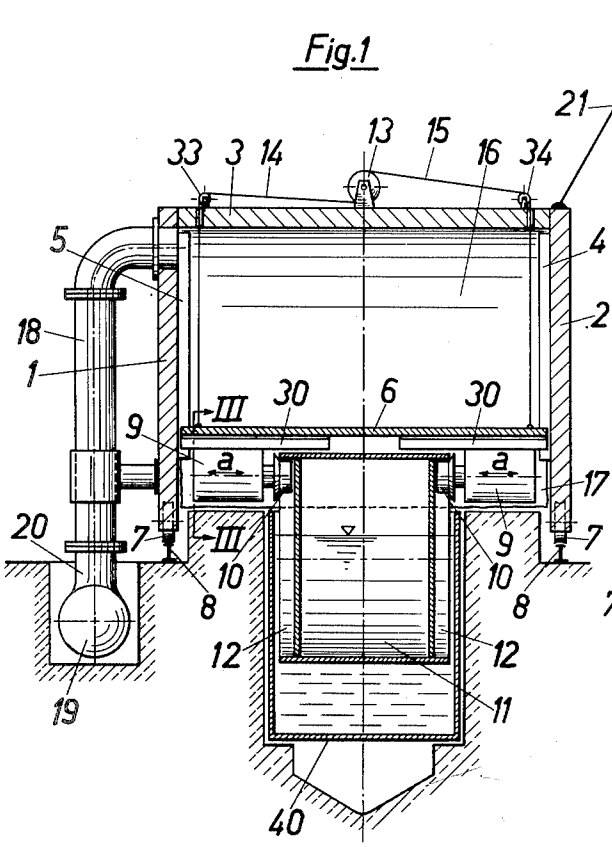


Fig.2

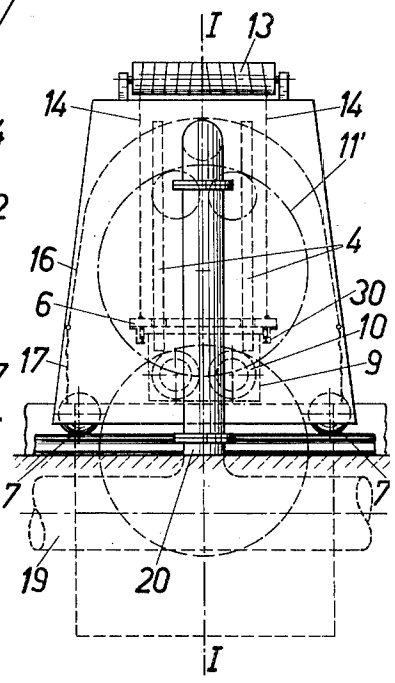


Fig.3

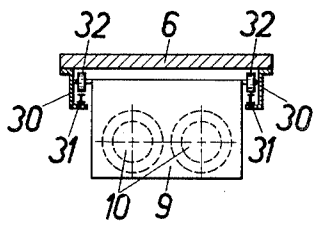


Fig.4

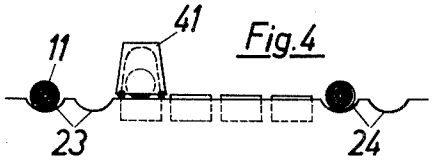
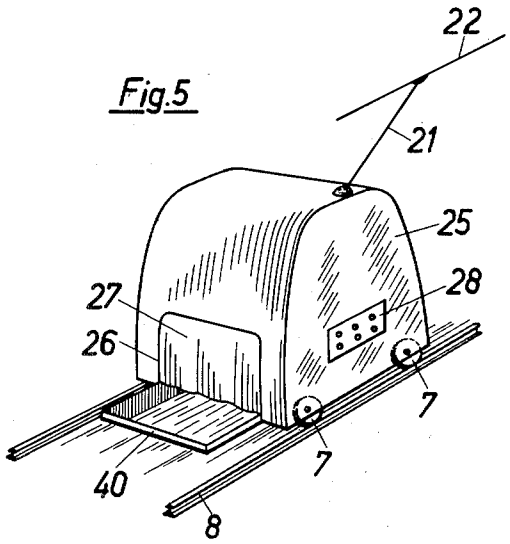


Fig.5



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PLANT FOR PICKLING METALLIC WORKPIECES

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13 Claims. (Cl. 51—164)

This invention relates to a plant for pickling metallic workpieces, comprising a series of tanks which are arranged one behind the other and in which drums filled with the workpieces to be treated are placed in succession. The tanks may be made of wood, metal or any other suitable material not attacked by the treating liquor contained in the tank. The drums are formed with apertures to enable an access of the treating liquor to the workpieces contained in the drum when the latter has been immersed in the tanks. Generally, several tanks are arranged one behind the other, which are filled in succession with pickling liquor, neutralizing liquor, rinsing liquor and the like, in which the workpieces are to be treated in succession.

It is of advantage to revolve the drum in the treating liquor to ensure that the material in the drum is thoroughly wetted by the treating liquor. That revolution of the drum is particularly important where metal strip is to be pickled, which is inserted in the drums in the form of a coil which tends to uncoil as the drum is revolved. This results in the formation of a loose coil, which enables a good penetration of the liquor in all convolutions. Moreover, the surfaces of the strip are abraded as the coil uncoils, whereby any residual scale adhering to them is removed. Thereafter the drum is revolved in the opposite sense, whereby the coil of strip is tightened again, subsequently the drum is placed into the next tank, where the operation described is repeated.

It is known to provide the shells of the drums with rims which project laterally beyond the drum ends and with which the drums are supported on rollers driven by a motor. In that case the rollers and the motor are mounted on a frame, which is provided with chains, whereby it is hung into the hook of the trolley of a hall crane, which transfers the drum from one tank into the other. During the immersion of the drum in the tank the frame is placed on the rim of the respective tank.

In that known construction it was necessary that the hall walls carrying the trolley track had a high strength owing to the heavy weight of the drum and its charge. The strong construction of the walls and the crane itself involved great prime costs. At the same time the operation was complicated and time-consuming. Another disadvantage resides in that the vapors that develop during the lifting of the drum from the pickling tanks were able to escape freely into the hall.

The subject of the invention is a drum-type pickling plant having a series of tanks filled with treating liquid, comprising a gatelike frame having wheels supported on rails on the ground for movement over the series of tanks, a cross-spar which can be lifted and lowered inside the frame, and supporting and drive rollers which are displaceably mounted on the cross-spar and are adapted to support the drum.

According to another feature of the invention the frame is provided with a hood which covers the pickling drum.

According to a further feature of the invention the hood is provided with vent pipe.

Another feature of the invention resides in that the lower ends of the hood consist of resilient aprons reaching to the tank rims.

Finally it is a feature of the invention that the frame with the covering hood forms a unitary upwardly and laterally closed space.

In the drawing Fig. 1 is a sectional view of the plant taken on line I—I of Fig. 2; Fig. 2 is a side view of the wheeled frame; Fig. 3 is a sectional view taken on line III—III of Fig. 1; Fig. 4 is a diagrammatic view of a pickling plant and Fig. 5 shows another embodiment of a wheeled frame.

The wheeled frame shown in Figs. 1 and 2 comprises side supports **1** and **2**, which are rigidly interconnected, e. g. by welding, by the cross-member **3**. The supports **1**, **2** and, if desired, also the cross-member **3** may consist of solid or apertured, preferably heavy-gauge metal plates, which may be provided with stiffening ribs. Alternatively said walls may be constructed as lattice structures. In the illustrative embodiment shown in Figs. 1 and 2 the supports **1**, **2** and the cross-member **3** are shown for the sake of simplicity as solid, heavy-gauge plates, the supports **1**, **2** being wider at the base than at the top. The supports **1**, **2** are provided on the inside with vertical guides **4**, **5** for the liftable and lowerable cross-spar **6**. The cross-spar **6** is formed with grooves in engagement with the guide rails **4**, **5**. Alternatively the cross-spar may be provided at its side faces with rollers which roll along the guide rails **4**, **5** during the lifting and lowering of the cross-spar.

The cross-spar may be formed as a solid, rigid plate or as a lattice structure, which may be enclosed by a frame.

Each of the side supports **1**, **2** has rollers **7** running on rails **8** disposed on both sides of the series of tanks. The tanks **40** are preferably countersunk in the floor. One or more of the rollers **7** are driven by a drive means not shown (e. g. by an electric motor).

On its underside the cross-spar **6** carries bearings **9** for the rollers **10**, on which the pickling drum **11** is suspended by means of its rims **12** protruding beyond the drum ends. In the present illustrative embodiment each bearing carries two rollers **10**. One or both bearings **9** are provided with a drive mechanism for at least one of the two rollers **10** associated with one bearing, by means of which the drum **11** can be caused to revolve. The drive mechanism is constructed to permit of revolving the drum selectively in one or the other direction. The bearings **9** are arranged to be horizontally displaceable in the direction of the arrows *a* along guide portions on the underside of the cross-spar **6**. For this purpose transoms **30** carrying rails **31**, on which rollers **32** affixed laterally to the bearings **9**, are provided on the underside of the cross-spar **6** (Fig. 3). The rollers **32** may be driven in both directions by drive means not shown.

The cross-spar **6** is suspended from cables or chains **14**, **15**, which are wound on and from a drum **13**, which can be driven in both directions by a motor not shown. The drum **13** is carried by the cross-member **3**. The cables or chains **14**, **15** extend through the cross-member **3** and are guided by guide rollers **33**, **34**. Alternatively the cross-spar may be lifted and lowered by screw spindles, which can be driven in both directions by a motor and on which nuts are moved up and down which are rigidly connected to the cross-spar. In that case the spindles are non-displaceably mounted so that their rotation will cause the nuts to travel up or down thereon and to move the cross-spar **6** in the same direction.

The frame is provided with a hood **16**, which covers the space in which the pickling drum **11** is lifted from the tanks **40** by the cross-spar **6** (position **11'** in Fig. 2). The hood **16** may consist of a sheet metal shell or of other

material which is not attacked by the fumes rising from the tanks and/or drums. The lateral edges of the hood **16** are rigidly connected to the inside walls of the supports **1**, **2**, e. g. by welding, soldering, or the like. It is also conceivable to select a detachable connection, the edges of the hood being provided with rigid eyes which are hung into corresponding hooks on the side walls of the supports. If the side walls of the supports **2** are apertured or consist of a lattice structure it is advantageous to provide the hood **16** also with lateral covering faces. To improve the holding of the hood **16** in position it may also be affixed to the cross-member **3**. Since it is desired to cover the space inside the frame down to the tank rims, whereas it is not possible to extend the hood **16** as far as to the tank rims, because the rims of the hood would be damaged by the tank rims when the frame is moved on the rails, the lower part of the hood **16** is formed as a flexible covering apron **17**, which can slip over the tank rims when the frame is moved on the rails.

A vent pipe **18** leads outwardly from the covering hood **16** to suck off the vapors from inside the covering hood. To this end an exhaust pipe **19** is extended parallel to the row of tanks, preferably in the hall floor. That exhaust pipe may be connected to an exhauster (not shown) and is provided with a connecting branch **20** adjacent to each of the tanks. When the frame is in operative position over the tanks the vent pipe **18** fits to the respective connecting branch **20**. The connecting branch **20** may be provided with a shutter, which normally closes the inlet opening of the connecting branch **20** and opens it only upon engagement by the pipe **18**.

A current collector **21** sliding along an overhead line **22** extending along the series of tanks is provided on the frame for feeding current to the drive motors for the rollers **7** of the frame, the drive drum **13** and the rollers **10**.

A central control panel is provided within reach of the operator for the control of the drive motors. With smaller plants the operator walks along the frame; with larger plants, particularly where the series of tanks is of substantial length, the frame is provided with an operator's cage.

As is diagrammatically shown in Fig. 4, troughs **23**, **24** are provided at both ends of the series of tanks for receiving the empty or full pickling drums to enable the drums to be filled or emptied. These troughs are recessed in the ground or a frame may be provided, which does not extend above the tanks and is formed with such troughs.

As is shown in Fig. 5, an advantageous construction has the supports **1**, **2**, the cross-member **3** and the hood **16** built together to form an integral body **25**. The other parts of the device are the same as in the illustrative embodiment described before. Guide ribs are again provided on the insides of the side walls of the body **25** for guiding a vertically movable cross-spar, whose underside is provided with slidably arranged bearings with drive and supporting rollers for the drum. For the sake of simplicity the drive drum for lifting the cross-spar is not shown in Fig. 5, just as the exhaust pipe for the discharge of the fumes from the interior of the body **25**. Only the current collector **21** with the overhead line **22** for feeding current to the drive motors, and the rollers **7** which support the body **25** and roll along the rails **8**. A central control panel **28** for controlling all drive elements is provided on the side wall of the body **25**, where a seat for the operator may also be attached, if desired. Adjacent to the operator the side wall of the body **25** may be formed with a sight hole for observing the processes inside the body. Said sight hole may be covered by a transparent plate of glass, plastic or the like. Cut-away portions **26** provided at both ends of the body **25** are covered with aprons **27** of elastic material, e. g. rubber, which extend down to the upper rims of the tanks **40** on which they slip during the forward and reverse movement of the body **25**.

The operation of the apparatus described is effected as follows: At the beginning the troughs **23** contain empty drums **11**, which are fed with the material to be charged. Thereafter the frame **41** (Fig. 1) is moved from the right to the left over one of the drums in the troughs **23**. The bearings **9** are moved outwardly towards the supports **1**, **2** and the cross-spar **6** is lowered to such an extent that when the bearings **9** are subsequently moved from the supports **1**, **2** towards the drum the rollers **10** come to lie below the apex of the rims **12**. Then the cross-spar **6** is lifted to cause the rollers **10** to engage the undersides of the rims **12** and to move the drum **11** along. When the drum has reached the position **11'** (Fig. 2) the frame is moved to the right (Fig. 4) over the first treating tank; thereafter the drum is lowered into the tank by the cross-spar **6**. Subsequently the drive means for the rollers **10** is actuated and the drum **11** is revolved alternatingly in both directions. Then the drum **11** is lifted into position **11'** and the frame is moved over the next treating tank, where the aforedescribed process is repeated. After the passage through the desired treatment tanks the pickling drum is placed into one of the troughs **24** at the other end of the series of tanks. To this end the cross-spar **6** with the drum **11** is lowered until the drum **11** rests in the trough **24** and the rollers **10** are spaced from the rim **12**. Thereafter the bearings **9** are moved outwardly towards the supports **1**, **2** the cross-spar is lifted, whereafter the frame is moved back to the troughs **23** to be able to move the next filled drum over the series of tanks. The returning frame may receive a drum which lies in one of the troughs **24** and has been emptied during the described operation to return the same to the starting troughs **23**, where it may be fed during the next working cycle. The return movement of the frame is preferably effected at higher speed than the working movement, for which an overdrive is provided in the drive mechanism for the frame.

It is advantageous to use split drums which consist of two detachably interconnected half-cylinders. One cylinder half remains permanently suspended from the cross-spar **6**, whereas the second half, which is to be charged lies in one of the troughs **23**. The working cycle begins by the movement of the frame with the one half-drum over the charged second half-drum and the lowering of the first-mentioned half-drum to the one mentioned in the second place, whereafter the two halves are interconnected by detachable parts. For this purpose on mutually opposite edges of the half-drums may be provided with eyes, whose openings are in register when the half-drums have been brought together. Then a rod is passed through said openings. When the drum is set down and the two half-drums have been separated, one of them remains suspended from the rollers **10** whereas the other one is left in the troughs **24** to enable it to be emptied. When the drum is set down, care must be taken only that the half-drums may be separated only when the parting plane between them is horizontal. That position can readily be achieved by a control of the drive for the rollers **10**. The split construction of the drum reduces the prime cost thereof because only half-drums are required instead of the whole drums required before, all half drums being equal so that the half-drum suspended from the rollers can be connected selectively to any of the half-drums in one of the troughs **23** or **24**. The drums thus constructed may be displaced over the series of tanks in the same manner as has been described hereinbefore.

Using the plant according to the invention even drums of great length and high weight of charge can be moved, placed into the treating tanks and rotated therein without difficulty. The drums may have or even exceed a length of as much as four meters and a weight of charge of 30 tons.

What is claimed is:

1. A drum-type pickling plant comprising a series of tanks filled with treating liquid, a drum having an aper-

tured shell and rotatable about a horizontal axis, which drum can be lowered into the tanks, supporting and drive rollers for supporting and rotating the said drum, a gate-like frame movable over the series of tanks, a cross-spar which can be lifted and lowered within the said frame, and bearings slidable on said cross-spar for carrying the said suporting and drive rollers for the drum.

2. A drum-type pickling plant as set forth in claim 1, in which the bearings are slidable on the underside of the cross-spar.

3. A drum-type pickling plant as set forth in claim 2, in which guides in which the bearings carrying said supporting and drive rollers are slidably arranged are provided on the underside of the cross-spar.

4. A drum-type pickling plant as set forth in claim 1, in which a hood covering the pickling drum is provided.

5. A drum-type pickling plant as set forth in claim 4, in which said hood has a vent pipe, which in the operating position of the frame fits a connecting branch of an exhaust pipe extending in the floor.

6. A drum-type pickling plant as set forth in claim 4, in which the lower ends of the hood are formed as resilient aprons extending to the tank rims.

7. A drum-type pickling plant as set forth in claim 4, in which the frame and the covering hood are formed as an integral body which is closed at the top and sides.

8. A drum-type pickling plant as set forth in claim 7, in which the end and rear walls of the body have a cut-away portion, which is covered by an apron extending to the tank rim.

9. A drum-type pickling plant as set forth in claim 1, in which the side walls of the frame have vertical guides for the cross-spar.

10. A drum-type pickling plant as set forth in claim 1, in which the said frame has a current collector for feeding current to the drive motors, said current collector sliding on an overhead line extending along the series of tanks.

11. A drum-type pickling plant as set forth in claim 1, in which the said frame has within reach of the operator a central control panel for controlling all drive motors.

12. A drum-type pickling plant as set forth in claim 1, in which the said frame has a driver's cage with a central control panel for controlling all drive motors.

13. A drum-type pickling plant as set forth in claim 1, in which troughs adapted to receive drums are provided at both ends of the series of tanks.

No references cited.