

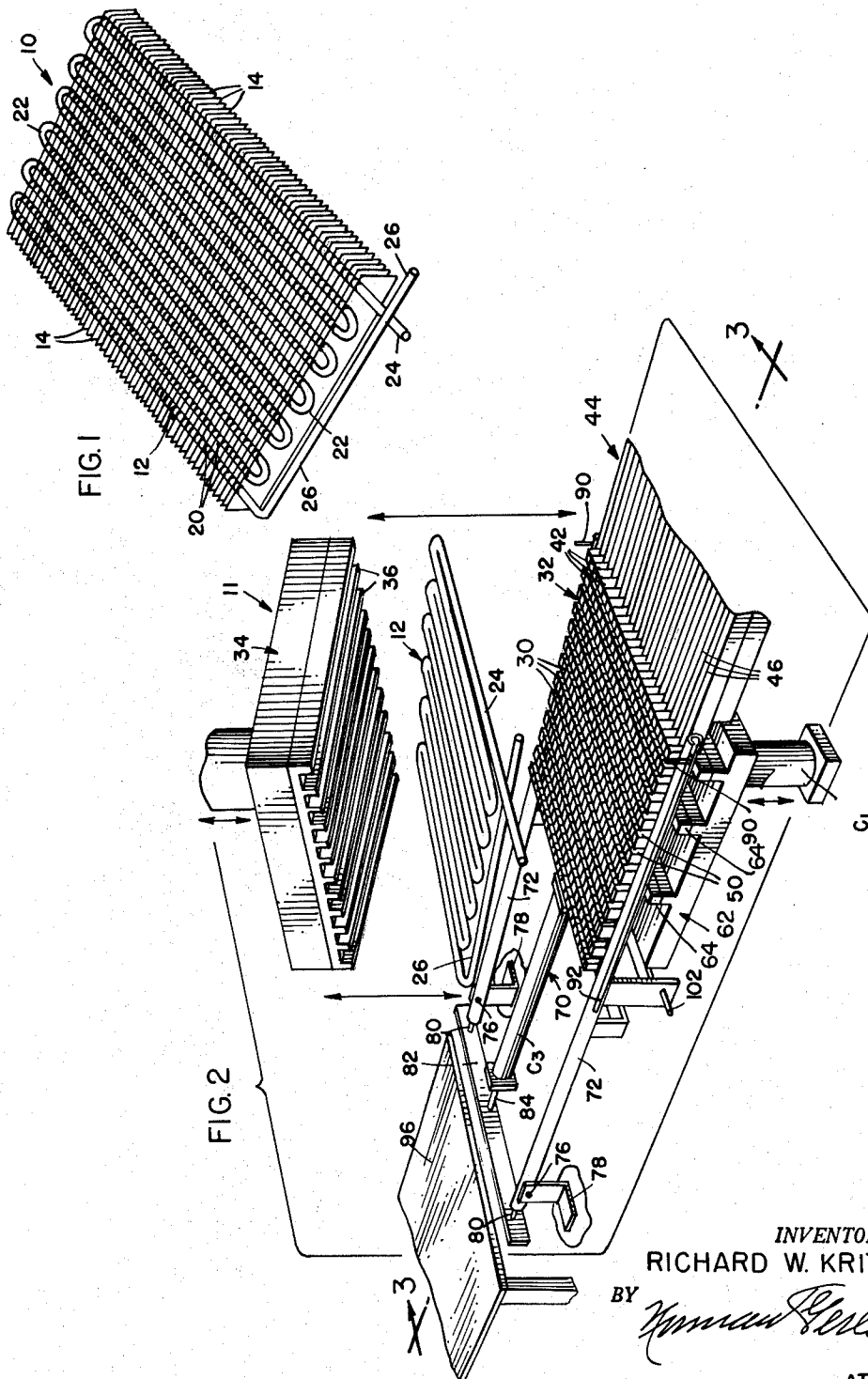
Sept. 3, 1963

R. W. KRITZER
AUTOMATIC MECHANISM FOR STRIPPING AND EJECTING
FIN-TYPE HEAT EXCHANGE UNITS FROM
AN ASSEMBLY PRESS

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3 Sheets-Sheet 1



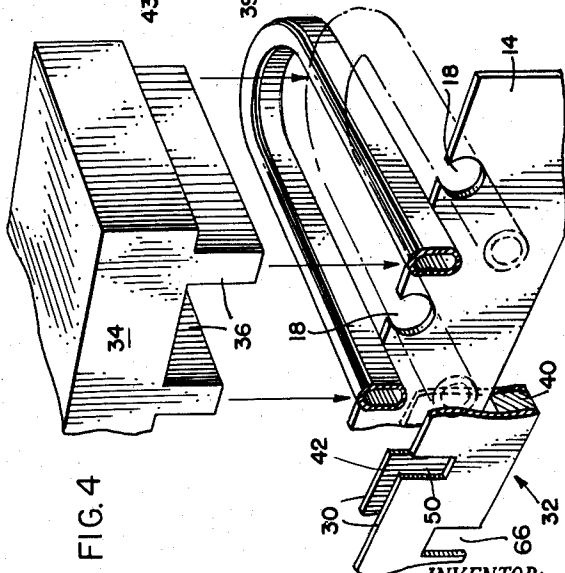
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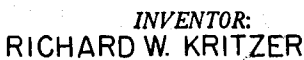
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Sept. 3, 1963 **R. W. KRITZER** **3,102,330**
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3,102,330

AUTOMATIC MECHANISM FOR STRIPPING AND EJECTING FIN-TYPE HEAT EXCHANGE UNITS FROM AN ASSEMBLY PRESS

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12 Claims. (Cl. 29—202)

The present invention relates to the manufacture of heat exchange units and has particular reference to an automatic stripping and ejecting mechanism for loosening heat exchange units which have been assembled by means of an hydraulic press from the assembly nest of such press and for thereafter forcibly ejecting the loosened units from the press to clear the press for a subsequent assembly operation.

Briefly, and as disclosed in pending United States patent application, Serial No. 6,782, filed on February 2, 1960, and entitled "Heat Exchange Units," a heat exchange unit of the type to which the present invention relates consists of a length of serpentine tube stock having spaced apart, straight reach sections and curved or arcuate end sections at the ends of the straight reach sections. A series of closely spaced, elongated parallel strips of flat fin stock are secured to and extend transversely of the straight reach sections. The method by means of which the strips of flat fin stock are secured to the tube stock is shown and described in United States Patent No. 2,913, 806, issued on November 24, 1959, and entitled "Fabrication of Heat Transfer Units." Briefly, such method involves providing in one longitudinal edge of each strip of fin stock a series of spaced arcuate notches which are major circle sectors and then positioning the strips in an assembly nest, associated with an hydraulic press, so that the notched edges thereof are presented upwardly with the notches of adjacent strips being aligned in transverse rows. Thereafter, a length of serpentine tube stock having the requisite number of reach sections is positioned above the loaded nest with the reach sections in vertical register with the various rows of notches, and the press platen is caused to descend upon the nest and force the reach sections of the length of serpentine tubing into the various notches. The reach sections are generally oval in transverse cross section and the minor axis of the ellipse involved is of less extent than the entrance openings of the notches so that the reach sections may readily enter the notches, after which the pressure of the platen in the direction of the oval elongation will expand the reach sections to circular form to the end that they will frictionally engage the notches and thus interlock the length of serpentine tubing with the strips of fin stock and produce the completed assembled heat exchange unit. The present invention is specifically concerned with the mechanism for removing the assembled heat exchange units from the assembly press.

In connection with the use of assembly presses of the type briefly outlined above, the strips of fin stock which are loaded into the assembly nest are closely confined between adjacent spacer strips associated with the nest. Each fin strip is frictionally confined between two of the spacer strips, one on each side thereof substantially coextensively along the strip. After the platen has descended and forced the straight reach sections of the tube stock into the notches provided in the fin stock strips, these strips are rigidified en masse and each of them tends to take on a definite set within the heat exchange assembly. This causes binding of the assembled heat exchange unit in the nest at practically all regions thereof, making it difficult to remove the assembly, especially where manual operations are concerned, as has heretofore invariably been the practice.

The present invention is designed to overcome this dif-

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ficulty in extracting the heat exchange units from the assembly nests of hydraulic assembly presses and, accordingly, it contemplates the provision of a semi-automatic machine, the operation of which is correlated with the operation of the hydraulic press, and which is automatically operable upon descent of the press platen to strip, or at least loosen, the completed and assembled heat exchange unit from the assembly nest of the press, and to, thereafter, forcibly eject the thus loosened unit from the assembly nest and conduct the same to a remote location.

The provision of a machine of the character set forth above being among the principal objects of the invention, it is a further object to provide such a machine wherein the various movable machine instrumentalities associated therewith are sequentially operable in timed relation, with each moving instrumentality serving, at the completion of its effective operation, to initiate commencement of the motion of the next instrumentality in the sequence, and with the last instrumentality serving, at the completion of its operation, to restore all instrumentalities, the operation of which preceded it, to their normal positions.

With these and other objects in view, which will become more readily apparent as the nature of the invention is better understood, the invention consists in the novel construction, combination and arrangement of parts shown in the accompanying three sheets of drawings forming a part of this specification.

In these drawings:

FIG. 1 is a perspective view of a heat exchange unit of the type with which the present invention is concerned;

FIG. 2 is a fragmentary exploded perspective view of an assembly press, schematically illustrating the manner in which fin and tube stock are assembled in the same, and showing adjacent portions of the present stripping and ejecting mechanism operatively associated therewith;

FIG. 3 is a front elevational view of the assembly press and the associated instrumentalities which comprise the present invention;

FIG. 4 is an enlarged fragmentary perspective view, schematic in its representation, illustrating certain details of the assembly nest and press platen, and disclosing the manner in which the tube stock is pressed into the notches provided in the fin stock;

FIG. 5 is a schematic perspective view of the mechanism of the present invention showing the parts thereof operatively applied to the hydraulic press and assuming their relative positions immediately prior to commencement of a machine cycle;

FIG. 5a is an enlarged detail fragmentary perspective view of a portion of the structure shown in FIG. 5;

FIG. 6 is a schematic perspective view similar to FIG. 5 but with the parts assuming their relative positions near the end of the machine cycle but prior to return thereof to their normal positions; and

FIG. 7 is a combined circuit diagram and schematic view illustrating the cyclic operation of the mechanism and the electrical control instrumentalities by means of which such operation is carried out.

The Composite Heat Exchange Unit

Referring now to the drawings in detail, and in particular to FIG. 1, a completely assembled heat exchange unit has been designated in its entirety at 10. This unit is exemplary of one form of unit which may be assembled in an hydraulic press of the type illustrated in FIG. 2 at 11, and which is capable of being stripped and ejected from the press by the mechanism of the present invention subsequently to be described. It will be understood that the invention is applicable to the stripping and ejection of numerous other forms of heat exchange units from the hydraulic presses in which they may be assembled.

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Briefly, the unit 10 consists of a single length of tubing 12 which has been bent to serpentine form and to which there has been applied a series of closely-spaced, parallel, elongated, flat strips 14 of sheet metal fin stock. Such strips establish a series of cooling fins which extend across and bridge the straight reach sections of the serpentine tube stock. The assembled tube and fin structure constitutes a basic heat exchange assembly which may be operatively installed or mounted in a wide variety of installations by means of suitable supporting framework, such as specially shaped mounting brackets which may fit over the reverse bends or arcuate end sections at the ends of the straight reach sections of the serpentine tubing 12.

The tube and fin stock components of the heat exchange unit 10 are adapted to be assembled in a suitable press such as the hydraulic press 11 shown in FIGS. 2, 3 and 4, and by the method which is shown and described in aforementioned United States Patent No. 2,913,806. Reference may be had to such patent for a detailed description of the method. It is deemed sufficient for purposes of disclosure herein to state that each strip 14 is severed from a large strip of metal, preferably aluminum, and that the upper longitudinal edge of each strip is interrupted at spaced regions therealong by arcuate notches 18 (see FIGS. 3 and 4). Each notch 18 constitutes a major circle sector which is slightly greater in extent than 180°. The length of tubing 12 includes, as hereinbefore indicated, a series of straight reach sections 20 and reverse bends 22 at the ends of the reach sections. The free ends 24 and 26 of the tubing 12 terminate at the same end of the unit, the end 24 being coaxial with one of the straight reach sections 20 and the end 26 being turned laterally. Obviously, where the serpentine tubing possesses an even number of reach sections, the ends thereof will terminate at the same end region of the unit 10, and where an odd number of such reach sections are provided, the ends 24 and 26 will terminate at opposite end regions of the unit.

The Assembly Nest

Prior to their association with the strips 14 of fin stock, and as described in Patent No. 2,913,806, the straight reach sections 20 of the tubing 12 are oval or elliptical in cross section, and the major axes of the ellipses are slightly less in length than the width of the entrance opening of each notch 22. The various strips 14 of preformed fin stock are confined between adjacent spacer strips 30 associated with an assembly nest such as the nest which has been designated in its entirety at 32 in FIGS. 2 and 3, with the fin strips extending in slightly spaced parallel relationship and with the various notches 18 arranged in straight transversely extending rows. The length 12 of tubing, which previously has been shaped to its serpentine configuration, is then positioned above the nest 32 so that the straight reach sections 20 thereof register vertically with the transverse rows of notches 18 and, thereafter, a pressing platen 34 having elongated pressing feet 36 is caused to descend upon the nest so that the pressing feet engage the straight reach sections 20 and force them into the notches 18 and against the bottoms of the notches so as to cause the tubing to expand into intimate contact with the edges of the notches and fill the same as shown in dotted lines in FIG. 4. In this manner, the strips of fin stock are frictionally bonded to reach sections of the tubing in intimate heat exchange relationship to produce the assembly 10 shown in FIG. 1. After the unit 10 has thus been formed, it is adapted to be stripped from the nest 32 and ejected from the press 12 by means of the stripping and ejecting mechanism of the present invention and which will shortly be described in detail.

Still referring to FIGS. 2, 3 and 4, the various spacer strips 30 of the assembly nest 32 are maintained in their slightly spaced relationship by means of a series of filler strips 40, the spacer strips and filler strips serving, in ef-

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fect, to provide a composite nest body having a series of upwardly presented grooves 42 in the upper side thereof, each groove being adapted to receive therein one of the fin strips 14. While the assembly nest 32 may be loaded manually with the operator working above the nest and placing the fin strips 14 in the open upper regions of the grooves 42, a more rapid and efficient loading of the nest may be attained by employing the loading mechanism shown and described in a copending United States patent application Serial No. 100,076, filed on April 3, 1961 and entitled "Automatic Apparatus for Loading an Assembly Nest With Fin Strips in the Production of Heat Exchange Units." By means of such mechanism, the strips 14 are slid endwise through the open ends of the grooves 42 and into position within the nest 32. Reference may be had to such application for a full disclosure of this method of loading the assembly nest with strips of fin stock since only a portion of such nest-loading mechanism has been illustrated herein in the immediate vicinity of the assembly nest 32. Briefly, the mechanism includes a work table 44 having a series of longitudinally extending channels 46 in the upper surface thereof. At a region remote from the press 12, the work table 44 is provided with a preliminary assembly nest (not shown) including relatively wide open pockets for receiving the fin strips 14, each pocket communicating with one of the channels 46. Pusher means (not shown) are provided for sliding the fin strip 14 from the pockets into the channels and along the latter toward the assembly nest 32 and finally into the grooves 42 of the assembly nest.

Each spacer strip 30 is provided with a series of notches 50 in the upper edge thereof and, considered collectively, the notches of the series of spacer strips are adapted to be arranged in transverse alignment to provide a series of rows of such notches designed for transverse register with the circular notches 18 in the fin strips 14 when the latter are in their operative positions within the assembly nest 32. These notches 50 provide clearance regions for the elongated pressing feet 36 of the press platen 34 when the latter descends upon the nest to force the reach sections 20 of the tubing 12 into the upwardly presented notches 18 provided in the fin stock as previously described.

General Considerations

Referring now to FIGS. 3, 5 and 6, the stripping and ejecting mechanism of the present invention involves in its general organization three sets of cooperating instrumentalities including stripping instrumentalities for stripping or loosening the assembled heat exchange unit 10 from its friction-tight position in the assembly nest 32 after the press platen has descended and performed its operative pressing stroke; lifting instrumentalities for elevating the thus loosened heat exchange unit so that the same will completely clear the assembly nest; and ejecting instrumentalities for sliding the thus loosened and elevated heat exchange unit laterally sidewise from the press to a region of discharge. The stripping instrumentalities are operable under the control of a fluid cylinder C1 which, preferably, is of the pneumatic type; the lifting instrumentalities are operable under the control of a similar fluid cylinder C2; while the ejecting instrumentalities are operable under the control of a fluid cylinder C3. The cylinders C1 and C2 are adapted to be actuated simultaneously so that the stripping and lifting instrumentalities are conjointly operable although the action of the lifting instrumentalities is delayed and becomes effective shortly after the stripping instrumentalities have completed their stripping function. The cylinder C3 is operable at a later point in the machine cycle and ejection of the heat exchange unit 10 takes place as the final operation which is performed upon the heat exchange unit. Actuation of the various cylinders C1, C2 and C3 takes place by electrical control means and this means is effective after the cylinder C3 has been actuated

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to restore the plungers associated with all of the cylinders to their retracted positions and, consequently, to restore all of the machine instrumentalities to their initial positions preparatory to commencement of the next cycle of operation for stripping of the assembly nest 32 and ejection of the stripped heat exchange unit from the press.

The Stripping Instrumentalities

The aforementioned stripping instrumentalities are designated in their entirety at 60 and are best seen at the lower right-hand side of FIG. 5. These instrumentalities include a stripper plate 62 which underlies the assembly nest 32 and is provided with a series of stripper bars 64 on the upper face thereof. Each spacer strip 30 of the assembly nest 32 is formed with a series of downwardly facing rectangular notches 66 in the lower edge thereof and are spaced conformably to the spacing of the bars 64 so that the notches 66, considered collectively, extend in rows transversely of the assembly nest. The stripper plate 62 is carried at the upper end of a vertically reciprocable plunger 68 associated with the fluid cylinder C1 and is movable between a lowered inoperative or normal position wherein it is entirely clear of the assembly nest 32, and a raised operative stripping position wherein the stripper bars 64 enter the rows of notches 66, engage the lower edges of the fin strips 14 which project across these notches, and forcibly push the entire heat exchange unit 10 upwardly a slight distance so that the fin strips 14 are dislodged from their tight frictional fit between the spacer strips and at least partially freed for subsequent elevation of the unit 10 under the influence of the lifting instrumentalities.

The Lifting Instrumentalities

The aforementioned lifting instrumentalities are designated in their entirety at 70. They are best illustrated in FIG. 5 in the central portion of this view, and they include a pair of parallel, spaced, elongated, lifting arms 72 which underlie the assembly nest 32 and traverse the nest longitudinally so as to project outwardly on opposite sides of the nest an appreciable distance. The medial regions of the lifting arms 72 are connected together for movement in unison by means of a crossbar 74. The left-hand end of each lifting arm 72 is pivoted as at 76 to a fixed supporting bracket 78 and thus the two arms 72, together with the crossbar 74, constitute, in effect, an H-shaped frame which is capable of limited swinging movement from the lowered inoperative normal retracted position wherein it is shown in FIG. 5, to the raised inclined operative position wherein it is shown in FIG. 6.

In the lowered position of the lifting arms 72, these arms lie well below the level of the assembly nest 32 and, in the raised position thereof, they straddle the assembly nest as indicated in dotted lines in FIG. 3 and extend at a slight incline with respect to a horizontal plane. The lifting arms 72 are spaced apart a distance slightly greater than the transverse width of the cluster of fin strips 14 and slightly less than the over-all transverse width of the unit 10, i.e., then the overall span of the length of serpentine tubing 12, so that these arms 72 are in vertical register with the reverse bends 22 of the tubing and so that they may engage the same on opposite sides of the unit 10 for lifting purposes.

As will be explained presently, the lifting arms 72 are movable into engagement with the reverse bends 22 on opposite sides of the unit 10 shortly after the stripper plate 60 has become effective to loosen the unit 10 from its frictionally-confined position in the assembly nest 32 so that these arms will serve to lift the previously-loosened unit 10 out of the assembly nest 32 preparatory to ejection thereof from the press 11.

Movement of the lifting arms 72 is effected under the control of a fluid cylinder C2 having a plunger 79, the upper end of which is connected to the crossbar 74.

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When the plunger 79 is in its retracted position within the cylinder C2, the lifting arms 72 will remain in their lowered position, and when the plunger is extended, the lifting arms will be moved to their raised inclined operative lifting position.

The Ejecting Instrumentalities

The ejecting instrumentalities, by means of which the previously loosened and elevated heat exchange unit 10 is forcibly ejected by an impelling operation and moved laterally away from the press 11 in a horizontal direction to a region of discharge, may best be seen at the left-hand ends of FIGS. 5 and 6. The two parallel lifting arms 72 are in the form of elongated lengths of tubing within which there are slidable longitudinally a pair of ejecting rods 80. The rods 80 project outwardly from the ends of the arms 72 which are adjacent to the supporting brackets 78 and are connected together for movement in unison by means of a crosshead 82. The medial region of the crosshead 82 is operatively connected to the plunger 84 of the fluid cylinder C3 and the remote end of the cylinder is mounted in a supporting block 86 mounted on the medial region of a second crossbar 88 which extends between the two lifting arms 72.

The ends of the ejecting rods 80 remote from the crosshead 82 carry respective ejecting fingers 90 which project radially outwardly through and are slidable in elongated slots 92 (see FIG. 5a) which are formed in the side of each lifting arm 72 and extend inwardly an appreciable distance from the distal ends thereof. These fingers 90 are turned upwardly as indicated at 94 so as to project above the level of the tubular arms 72 and in order that they may engage the heat exchange unit which rests upon these arms when the latter are in their elevated position.

From the above description, it will be seen that when the plunger 84 of the cylinder C3 is in its retracted position as shown in FIG. 5, the ejecting rods 80 will be withdrawn into the tubular lifting arms 72 and the unit-engaging ejecting fingers 90 will lie behind the heat exchange unit 10, so to speak, with the latter being disposed in the path of movement of the fingers. As the plunger 84 is projected from the cylinder C3, the crosshead 82 will be moved outwardly away from the press 11 and the ejecting rods 80 will be slid longitudinally through the arms 72 so that the fingers 90 will engage the trailing edge of the heat exchange unit 10 and cause the unit to be slid longitudinally over the upper edges of the arms toward a region of discharge. When the fingers 90 reach the inner ends of the slots 92 within which they are movable, the momentum attained by the heat exchange unit will be sufficient to carry it, by a coasting action, completely from the arms 72 and onto the upper surface of a receiving table 96. In so moving toward its advanced position, the crosshead 82 is adapted to move beneath the table 96 so that there is no interference with the operation of the ejecting mechanism.

The Electrical and Hydraulic Control Instrumentalities

Still referring to FIGS. 3, 5 and 6, and additionally to the schematic circuit diagram of FIG. 7, each of the cylinders C1, C2 and C3 is of the magnetically actuated type wherein a solenoid magnet controls the operation of a three-way valve associated with the cylinder and which, in turn, selectively supplies motive fluid to the opposite ends of the cylinder. The control magnets for the cylinders C1, C2 and C3 are designated at M1, M2 and M3, respectively, while the valves associated with the solenoid magnets are designated at V1, V2, and V3, respectively.

Each of the solenoid magnets M1, M2 and M3, is of the dual-acting type having two magnet windings associated therewith for reverse control of its respective valve. Each magnet is operable under the control of two of three microswitches S1, S2 and S3, the magnet M1 being controlled by the microswitches S1 and S3, the magnet

M2 also being controlled by the microswitches S1 and S3, and the magnet M3 being controlled by the microswitches S2 and S3. The microswitch S3 is thus common to all three solenoid magnets M1, M2 and M3 and serves to control the reverse functions of these magnets. Each of the microswitches is of the normally open contact type wherein closure of its respective pair of contacts serves to establish an electrical circuit through one or more of the magnets.

The various pairs of contacts associated with the microswitches S1, S2 and S3 are successively operable, each pair of contacts awaiting completion of the operation or operations initiated by the preceding pair of contacts and the contacts becoming effective in the order named. As previously indicated, the various contacts are mechanically actuated by means of actuating fingers which are movable bodily with a moving instrumentality so that no relay devices, time delay or holding circuits or other electro-mechanical instrumentalities are required.

As shown in FIGS. 5 and 6, the microswitch S1 is positioned in the path of movement of an actuating finger 100 mounted on the press platen 34 and movable bodily therewith so that as the platen reaches the limit of its downward movement, the contacts of the microswitch S1 will become closed. The microswitch S2 is positioned in the path of movement of an actuating finger 102 mounted on, and movable bodily with, the crossbar 88 so that at such time as the lifting arms 72 reach the limit of their upward travel, the contacts of the microswitch S2 will become closed. The microswitch S3 is positioned in the path of movement of an actuating finger 104 mounted on, and movable bodily with, the crosshead 82 so that immediately after ejection of each of the heat exchange units 10 from the press 11, the contacts of this latter microswitch will become closed.

Operation of the Mechanism

In the operation of the mechanism, after the assembly nest 32 has been fully loaded with fin strips 14 and the length of serpentine tubing 12 positioned above the nest in proper registry with the fin strips 14, the master switch MS (see FIG. 7) may be closed to make electrical current from a source S, which may be the conventional 110-volt or 220-volt power line, available for operation of the mechanism. The platen 34 of the hydraulic press 11 is then caused to descend upon the nest to engage the straight-reach sections 20 of the tubing and force the same into the notches 18 provided in the upper edges of the strips 14 in the usual manner of assembly of such tubing and fin stock. As the platen approaches the end of its operative downward stroke, the actuating finger 100 will engage the microswitch S1 and close the contacts thereof, whereupon an electrical circuit will be established through the closed contacts of the microswitch S1. This circuit will extend from the source S, through the master switch MS, and from one side 15 of the line, through lead 17, contacts of the switch S1 (now closed), leads 19, 21, forward winding of the magnet M1, and lead 23 back to the other side of the line 15. Energization of the magnet M1 will cause the valve V1 to supply fluid to one end of the cylinder C1 and extend the plunger 68 thereof so as to raise the stripper plate 60 and effect stripping or loosening of the heat exchange unit 10 from the assembly nest in the manner previously set forth in detail.

Closure of the contacts of the switch S1 will also establish a second circuit from the line 15 through lead 17, contacts of the switch S1, lead 25, forward winding of the magnet M2, and lead 27 back to the line. Energization of the magnet M2 will effect actuation of the valve V2 to supply fluid to the cylinder C3 and extend the plunger 79 thereof so as to raise the two parallel lifting arms 72.

It is to be noted at this point that, although the two cylinders C1 and C2 are thus simultaneously operated

so that the stripper plate 60 and lifting arms 72 move upwardly in unison, by the time that the lifting arms 72 move into engagement with the reverse bends 22 of the serpentine tubing 12, as previously described, to effect their lifting action, the stripper plate 60 already has elevated the heat exchange unit 10 and thus loosened it in the assembly nest 32 so that the relatively less powerful upward thrust of the lifting arms 72 will be of sufficient magnitude to elevate the unit 10 completely from the nest.

As the lifting arms 72 approach the limit of their upward travel, the actuating finger 102 engages the microswitch S2 and causes the contacts thereof to become closed, thus establishing a circuit from the line 15 through lead 31, contacts of the microswitch S2 (now closed), lead 33, forward winding of the magnet M3 of the cylinder C3, and lead 35 back to the line. Energization of the magnet M3 will cause actuation of the valve V3 in a manner to supply fluid to the cylinder C3 and extend the plunger 84 thereof and thus cause the ejecting fingers 90 to impel the elevated heat exchange unit 10 from the hydraulic press 11 in the manner specifically described previously.

Forward movement of the plunger 84 will cause the crosshead 82 to move toward the discharge table 96 and, as the crosshead approaches the limit of its forward travel, the actuating finger 104 carried thereby will engage the microswitch S3 and close the contacts thereof. Closure of the contacts of the microswitch S3 will establish a circuit extending from the line through lead 39, contacts of the microswitch S3 (now closed), leads 41, 43, 45, reverse winding of the magnet M1 and lead 23 back to the line. A second circuit will be established from the line through lead 39, contacts of the microswitch S3, leads 41, 47, reverse winding of the magnet M2, and lead 27 back to the line. A third circuit will be established from the line through lead 39, contacts of the microswitch S3, leads 41, 43, 49, reverse winding of the magnet M3 and lead 35 back to the line. Energization of the reverse windings of the three magnets M1, M2 and M3 as just described will cause retraction of the plungers associated with the three cylinders C1, C2 and C3, whereupon all of the operative instrumentalities associated with the stripping, lifting and ejecting functions of the machine will be restored to their normal inoperative positions preparatory to initiation of the next succeeding machine cycle by the press platen upon descent thereof.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit of the invention. For example, the specific location of the various microswitches and of the actuating fingers therefor as illustrated herein is only exemplary of possible effective positions of these members. The actuating fingers may be positioned on any moving part of the assembly with which it is associated where movement of such part will carry the finger into contact with its respective microswitch at the required time in the machine cycle. Similarly, although the stripping instrumentalities and the lifting instrumentalities are disclosed herein as being simultaneously operable in unison, since the function of the lifting instrumentalities is required at a time in the machine cycle which is subsequent to the stripping or loosening of the heat exchange unit 10 from its friction-tight position in the assembly nest 32, it is not essential that the motion of these instrumentalities be initiated at the same time or under the control of the same microswitch as has been disclosed herein. It is within the purview of the present invention to provide separate and sequentially operable control switches and hydraulic devices for these instrumentalities. The simultaneous operation thereof as described herein is resorted to in the interests of economy in that an appreciable saving in electrical equipment is effected. It also is within the scope

of the present invention to adapt the same for use in connection with the assembly nest loading mechanism of my copending patent application Serial No. 100,076, as a fully automatic machine by causing the platen 34 of the hydraulic press 11 to be actuated under the control of an additional microswitch positioned in the path of movement of the fin strips 14 or a moving element of the loading mechanism therefor. Therefore, only insofar as the invention has particularly been pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. In an assembly press of the character described, the combination with an assembly nest including a nest body having a series of elongated upwardly facing parallel grooves therein for receiving and confining with a tight friction fit the lower edges of respective strips of fin stock and for maintaining the strips upright and in closely spaced parallelism while lengths of tube stock are pressed into notches provided in the upper edges of the upright strips to produce a composite tube and fin type heat exchange unit, said nest body being provided with openings in the underneath side thereof intersecting said grooves and thus exposing the lower edges of a support, the strips disposed therein, a stripper member disposed beneath said nest and mounted on said support for vertical movement between a lowered position wherein it clears said nest and a raised position wherein it extends into said openings, said stripper member being adapted during movement toward its raised position to enter said openings, engage the lower exposed edges of the strips, and exert an upward thrust upon the heat exchange unit so as to displace the same bodily upwardly and thus strip the unit from its tight frictional confinement in the assembly nest, a lifting member likewise disposed beneath the nest and mounted on said support for vertical movement between lowered and raised positions, said lifting member being adapted during movement toward its raised position to engage a portion of the upwardly displaced heat exchange unit and elevate the same above the level of the assembly nest, a first fluid motor for moving said stripper member between its lowered and its raised positions, a second fluid motor for moving said lifting member between its raised and its lowered positions, and means for actuating said fluid motors in unison to effect simultaneous movement of the stripper and lifting members toward their respective raised positions.

2. In an assembly press of the character described, the combination set forth in claim 1 and wherein the amplitude of vertical displacement of the stripping and lifting members respectively and their respective rates of movement are such that the stripping member is effective to displace the heat exchange unit bodily upwardly and thus effect its stripping operation prior to engagement of the lifting member with the displaced unit.

3. In an assembly press of the character described, the combination set forth in claim 1 and wherein said lifting member includes a pair of lifting arms on opposite sides of the assembly nest respectively and which are operable during upward movement of the lifting member to straddle the nest and engage overhanging portions of the heat exchange unit for lifting purposes.

4. In an assembly press of the character described, the combination with an assembly nest including a nest body having a series of elongated upwardly facing parallel longitudinally extending grooves in the upper face thereof for receiving and confining with a tight friction fit the lower edges of respective strips of fin stock and for maintaining the strips upright and in closely spaced parallelism while the straight reach sections of a length of serpentine tube stock are pressed into notches provided in the upper edges of the upright strips to produce a composite tube and fin type heat exchange unit having reverse tube bends connecting the reach sections of the tube stock, said nest body being provided with a series of parallel transversely

extending grooves in the underneath face thereof intersecting said longitudinally extending grooves and thus exposing the lower edges of the strips disposed therein, of a stripper plate disposed beneath said nest and provided on its upper face with a plurality of stripper bars, said stripper plate being mounted for vertical movement between a lowered position wherein the stripper bars clear the nest and a raised position wherein said stripper bars extend into said transversely extending grooves, said stripper bars being adapted during upward movement of the stripper plate to enter said transversely extending grooves, engage the lower exposed edges of the strips, and exert an upward thrust upon the heat exchange unit so as to displace the same bodily upwardly and thus dislodge the unit from its tight frictional fit in the assembly nest, and a pair of parallel lifting arms disposed below the level of the assembly nest and pivoted for swinging movement in unison about a horizontal axis between a lowered position and a raised position wherein portions thereof straddle the nest, said lifting arms being adapted during movement toward their raised position to engage the reverse bends at the ends of the dislodged unit and elevate the unit completely above the level of the assembly nest.

5. In an assembly press of the character described, the combination set forth in claim 4, including, additionally, a first fluid motor for moving said stripper plate between its lowered and raised positions, a second fluid motor for moving said lifting arms between their lowered and raised positions, and control means for actuating said fluid motors in unison.

6. In an assembly press of the character described, the combination set forth in claim 5 and wherein the amplitude of vertical displacement of the stripping plate and lifting arms respectively and their respective rates of movement are such that the stripping plate is effective to displace the heat exchange unit bodily upwardly and thus effect its stripping action prior to engagement of the lifting arms with the reverse bends of the upwardly displaced unit.

7. In an assembly press of the character described, the combination set forth in claim 5, including, additionally, a press platen disposed above the assembly nest and adapted to descend upon the nest and engage said straight reach sections of the tube stock to press them into said notches in the upper edges of the strips of fin stock, a first fluid motor for moving said stripper plate between its lowered and raised positions, a second fluid motor for moving said lifting arms between their lowered and raised positions, control means for actuating said fluid motors in unison, and means operable upon descent of said press platen for initiating the operation of said control means.

8. In an assembly press of the character described, the combination with an assembly nest including a nest body having a series of elongated upwardly facing parallel longitudinally extending grooves in the upper face thereof for receiving and confining with a tight friction fit the lower edges of respective strips of fin stock and for maintaining the strips upright and in closely spaced parallelism while the straight reach sections of a length of serpentine tube stock are pressed into notches provided in the upper edges of the upright strips to produce a composite tube and fin type heat exchange unit having reverse tube bends connecting the reach sections of the tube stock, said nest body being provided with a series of parallel transversely extending grooves in the underneath face thereof intersecting said longitudinally extending grooves and thus exposing the lower edges of the strips disposed therein, of a stripper plate disposed beneath said nest and provided on its upper face with a plurality of stripper bars, said stripper plate being mounted for vertical movement between a lowered position wherein the stripper bars clear the nest and a raised position wherein said stripper bars extend into said transversely extending grooves, said stripper bars being adapted during upward movement of the stripper plate to enter said transversely extending grooves,

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engage the lower exposed edges of the strips, and exert an upward thrust upon the heat exchange unit so as to displace the same bodily upwardly and thus dislodge the unit from its tight frictional fit in the assembly nest, a pair of parallel lifting arms disposed below the level of the assembly nest and pivoted for swinging movement in unison about a horizontal axis between a lowered position and a raised position wherein portions thereof straddle the nest, said lifting arms being adapted during movement toward their raised position to engage the reverse bends at the ends of the dislodged unit and elevate the unit completely above the level of the assembly nest, and an ejecting member slidably mounted on said lifting arms and movable longitudinally therealong and longitudinally of the assembly nest and engageable with a portion of the elevated heat exchange unit supported thereby when the arms are in their raised positions for impelling the unit along said arms and ejecting the same laterally from the press.

9. In an assembly press of the character described, the combination set forth in claim 8 and wherein said lifting arms are tubular and open at adjacent ends, and wherein said ejecting member comprises a pair of rods telescopically and slidably disposed within said tubular arms respectively and having adjacent ends thereof projecting outwardly through the open ends of the arms, a crosshead connecting said rods for sliding movement in unison, each of said arms being formed with an elongated slot therein, and an ejecting finger on each rod and projecting outwardly through the slot in its respective arm.

10. In an assembly press for assembling a first article upon a second article by a pressing operation wherein the first article is pressed into a recess provided in the second article, in combination, a holder for frictionally receiving the second article, a platen movable between a retracted position wherein it is out of contact with the first article and an advanced position wherein it engages the first article and forces it into the recess in the second article, a stripper element movable between a retracted position wherein it is out of contact with the second article and an advanced position wherein it engages the second article and displaces it in the holder to loosen the frictional bond between the second article and the holder, a lifter element movable between a retracted position wherein it is out of contact with the first article and an advanced position wherein it engages the first article and elevates the latter, and consequently the second article with which it

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is frictionally united, from the holder, an ejecting element movable between a retracted position wherein it is out of contact with both of said articles and an advanced position wherein it engages one of said articles and ejects the same, together with the other article with which it is frictionally united from the press, and control means for moving said stripper element and said lifting element in unison from their retracted positions to their advanced positions, and for thereafter moving said ejecting element from its retracted position to its advanced position.

11. In an assembly press for assembling a first article upon a second article, the combination set forth in claim 10 and wherein said control means comprises first, second and third reversible fluid motors for the stripper, lifter and ejecting elements respectively, first, second and third control valves operatively connected to the first, second and third fluid motors respectively for selectively actuating the same in opposite directions, first, second and third solenoids for the first, second and third control valves, each solenoid having a forward and a reverse winding, a first microswitch operable upon actuating thereof to effect energization of the forward windings of the first and second solenoids, a second microswitch operable upon actuation thereof to effect energization of the forward winding of the second solenoid, a third microswitch operable upon actuating thereof to effect energization of the reverse windings of the first, second and third solenoids, a first actuating element on the press platen and engageable with said first microswitch when the platen moves to its advanced position, a second actuating element on one of said movable elements and engageable with the second microswitch when said one movable element moves to its advanced position, and a third actuating element on said ejecting element and engageable with the third microswitch when said ejecting element moves to its advanced position.

12. In an assembly press for assembling a first article upon a second article, the combination set forth in claim 11 and wherein said second actuating element is disposed on the lifter element.

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