Oct. 27, 1953

C. E. TALLIS

2,657,046

AUTOMATIC FEED MECHANISM FOR POWER PRESSES AND LIKE MACHINES

Filed Aug. 20, 1951

6 Sheets-Sheet 1

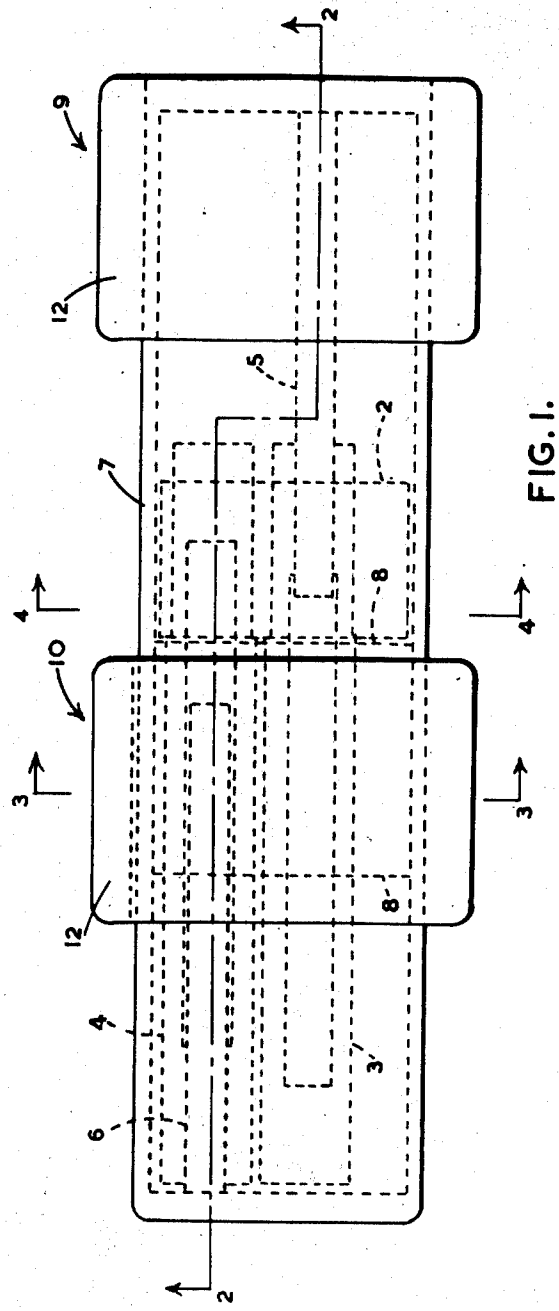

FIG. 1.

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6 Sheets-Sheet 2

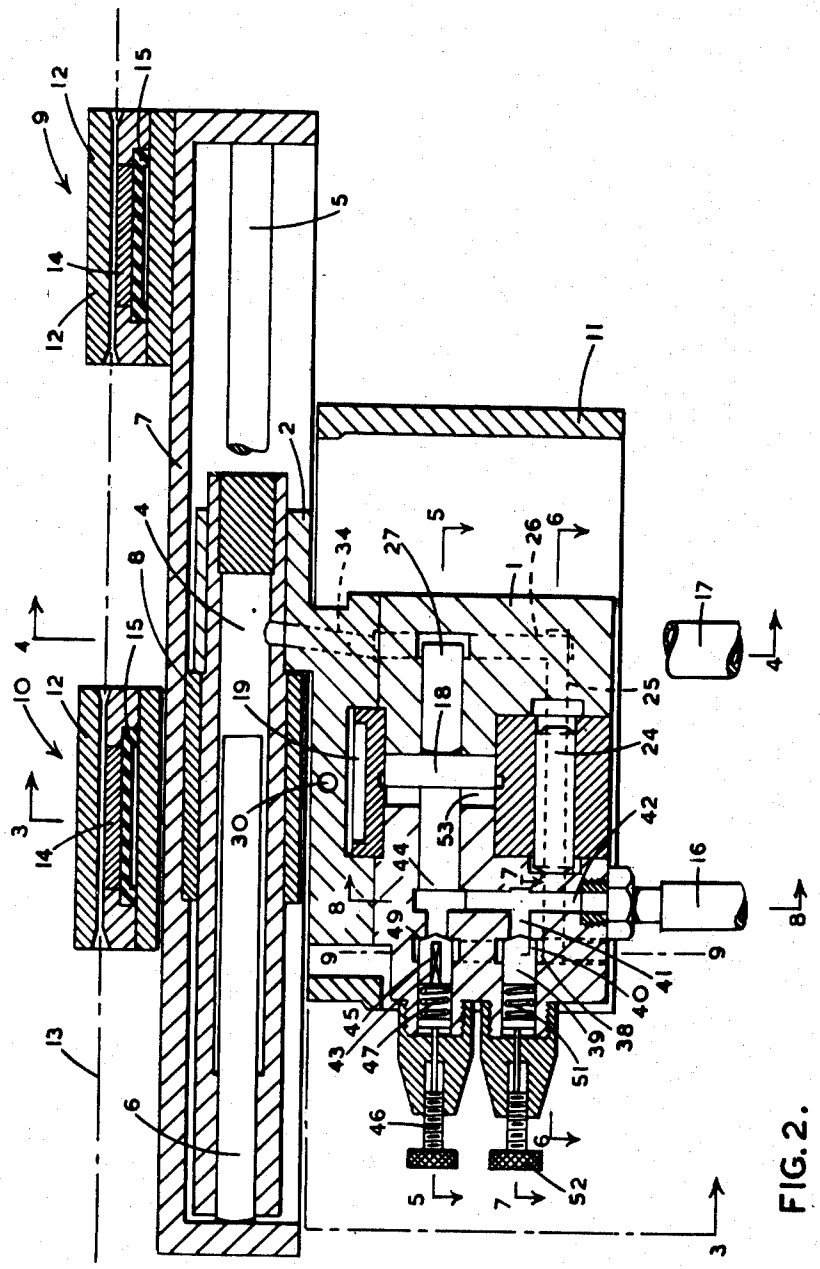

FIG. 2.

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AUTOMATIC FEED MECHANISM FOR POWER PRESSES AND LIKE MACHINES

Filed Aug. 20, 1951 6 Sheets-Sheet 3

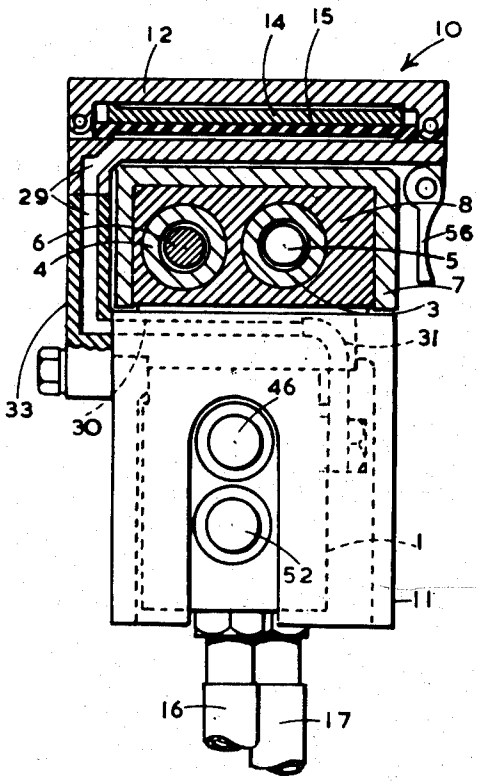

FIG. 3.

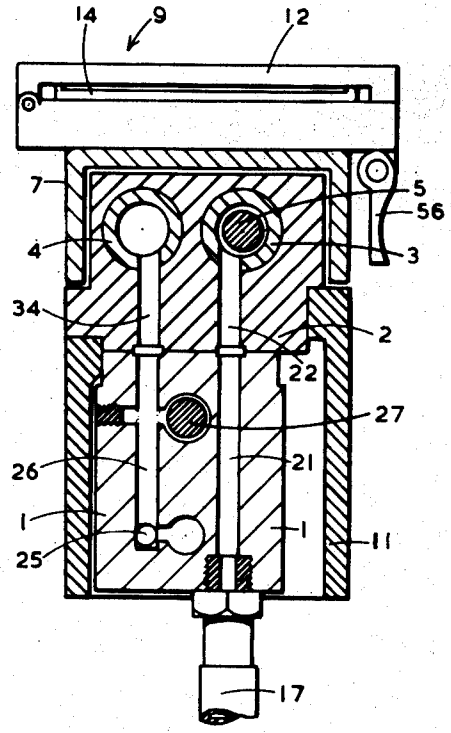

FIG. 4.

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AUTOMATIC FEED MECHANISM FOR POWER PRESSES AND LIKE MACHINES

Filed Aug. 20, 1951 6 Sheets-Sheet 4

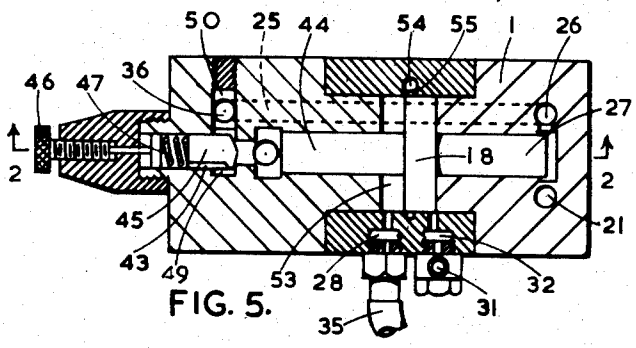

FIG. 5.

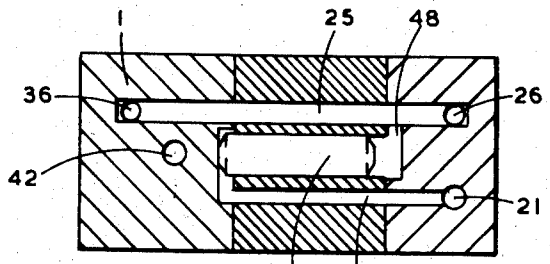

FIG. 6.

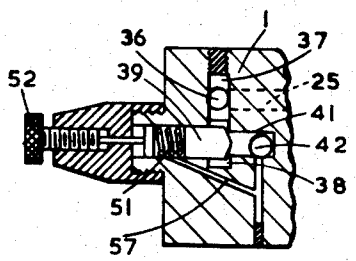

FIG. 7.

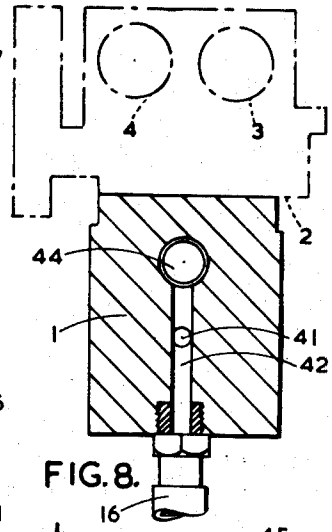

FIG. 8.

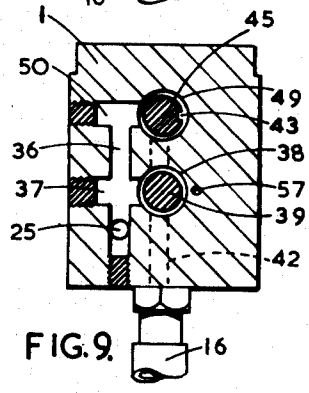

FIG. 9.

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6 Sheets-Sheet 5

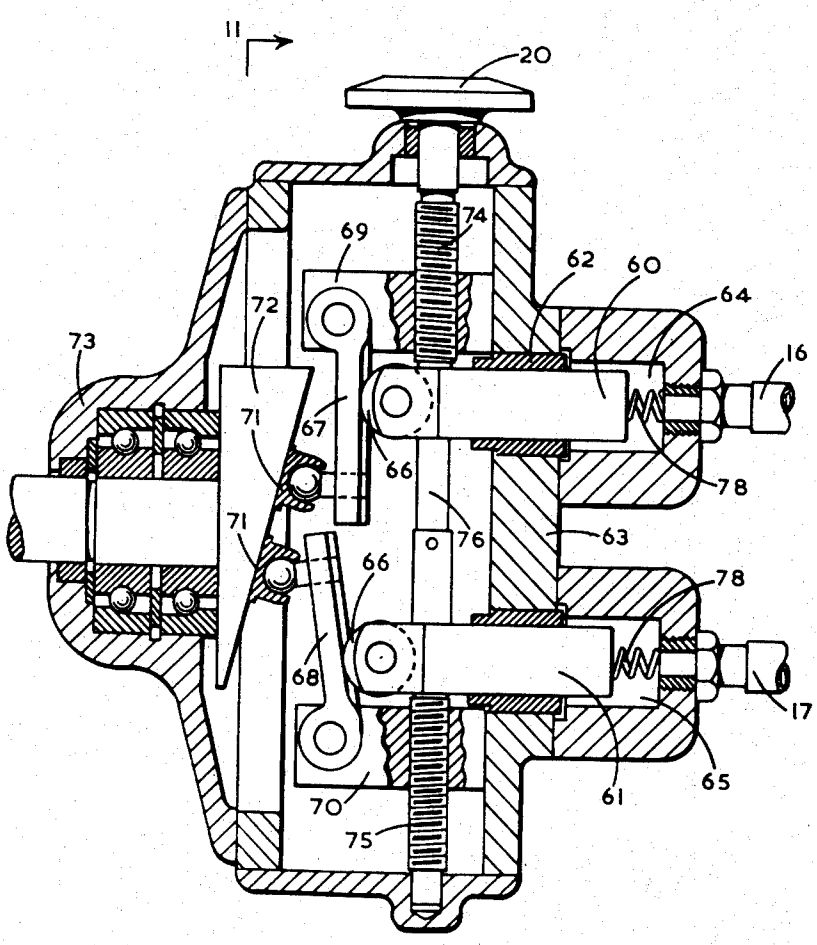

FIG. 10.

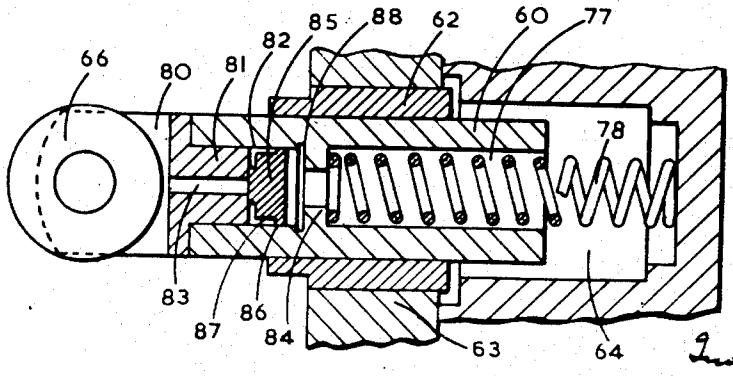

FIG. 13.

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AUTOMATIC FEED MECHANISM FOR POWER PRESSES AND LIKE MACHINES

2,657,046

Filed Aug. 20, 1951

6 Sheets-Sheet 6

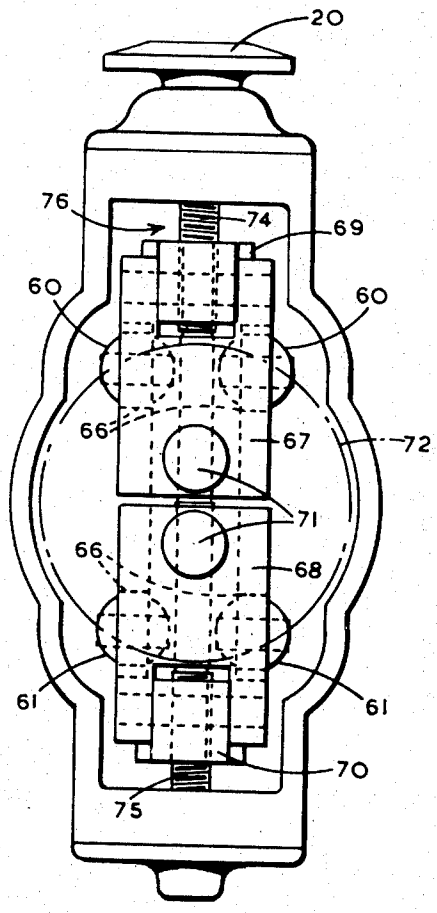

FIG. 11.

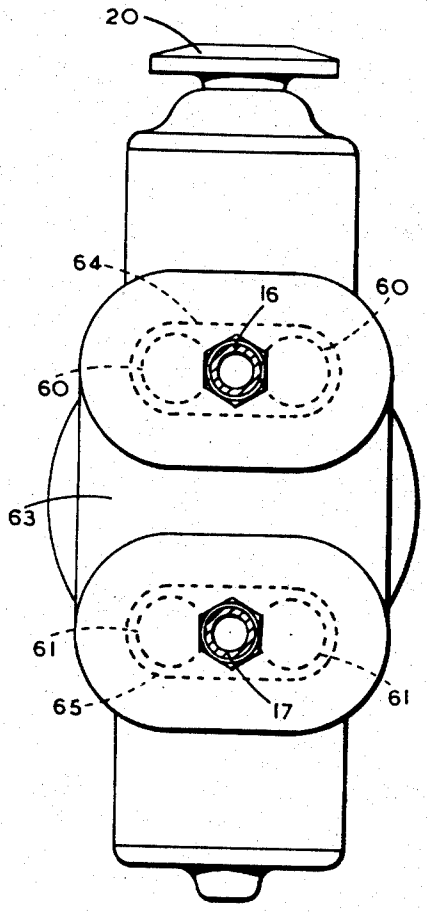

FIG. 12.

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Patented Oct. 27, 1953

2,657,046

UNITED STATES PATENT OFFICE

2,657,046

AUTOMATIC FEED MECHANISM FOR POWER PRESSES AND LIKE MACHINES

Charles Edward Tallis, Birmingham, England, assignor to Birmingham Tool & Gauge Company Limited, Handsworth, England

Application August 20, 1951, Serial No. 242,763
In Great Britain August 29, 1950

6 Claims. (Cl. 271—2.5)

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This invention comprises improvements in or relating to automatic feed mechanism for power presses and like machines. The object of the present invention is to provide a hydraulically operated feed mechanism, wherein the pitch of the feed can be readily adjusted whilst the press or like machine is in operation. A further object of this invention is to provide means whereby the extent of intermittent feed movement of the strip or like stock being fed can be infinitely varied between limits.

Referring to the drawings,

Figure 1 is a plan view of strip feeding means according to this invention.

Figure 2 is a sectional elevation taken on the line 2—2 of Figure 1 as regards the upper part of the elevation, the lower part corresponding to a section taken on the line 2—2 of Figure 5.

Figure 3 is a cross sectional view taken on the line 3—3 of Figure 1 or Figure 2.

Figure 4 is a cross sectional view taken on the line 4—4 of Figure 1.

Figures 5, 6 and 7 are detail cross sectional plan views taken on the lines 5—5, 6—6 and 7—7 respectively, of Figure 2.

Figures 8 and 9 are detail cross sectional views taken on the lines 8—8 and 9—9 respectively of Figure 2.

Figure 10 is a cross sectional elevation of the pump or impeller.

Figure 11 is a view taken on the line 11—11 of Figure 10, i. e. an end view of the impeller with the cover removed.

Figure 12 is a view of the other end of the impeller, and

Figure 13 is a detail sectional view on an enlarged scale of one of the impeller plungers showing the automatic replenishing valve mechanism therein.

In herein describing the invention with reference to the accompanying drawings as applied to means for feeding strip metal, a general outline of same is first given, the various parts being subsequently described in detail.

Referring to Figures 1 and 2 the base 11 of the machine houses a block assembly 1 containing valve controlled ducts on which is mounted a support member 2 for two hydraulic rams in the form of two parallel cylinders 3, 4 containing pistons 5, 6 respectively, arranged to operate in opposite directions (see Figure 1) on a suitable table 7 carried by a saddle 8 which slides on the cylinders 3, 4 so that the latter form guides for slidably supporting the table 7.

Carried at one end of the table 7 is a gripper

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unit 9, whilst a similar fixed gripper unit 10 extends across the table and is mounted on the base 11. Both these gripper units have hinged covers 12 acting as a normally fixed pressure pad and arranged to open bookwise in the body part of the gripper unit to enable the strip (indicated by the chain dotted line 13) to be placed on pads 14 within each unit, a rubber diaphragm 15 being placed underneath each pad 14 so that on hydraulic fluid such as a suitable oil being fed under the diaphragm 15 the pad 14 is urged towards the cover 12 to grip the strip 13 when the cover is secured in the closed position by the fastening means 56.

The cylinders 3, 4 are connected through the valve block 1 by means of pipes 16, 17 to an impeller (Figure 10) for forcing and withdrawing oil alternately from said cylinders 3, 4. Thus on oil being forced to the forward cylinder 3 the table is moved forward, oil being expelled from the return cylinder 4 and vice versa, the two columns of oil from the cylinders via the block 1 and pipes 16, 17 to the impeller acting after the manner of hydraulic push rods, the oil of each column alternately moving to and fro.

The oil line connected by the pipe 17 passes directly through the block 1 to the forward cylinder 3, but the other oil line is led to the return cylinder 4 through the pipe 16 via a series of valve controlled ducts in the block 1 whereby the reciprocating motion of the table 7 is controlled in relation to the opening and closing of the gripper units 9, 10 which are operated by a separate hydraulic system comprising mainly the operating piston 18 and a small reservoir 19 (see Figure 2).

The arrangement is such that just prior to the commencement of a forward movement of the table the gripper unit 9 grips the strip 13, whilst the unit 10 releases its grip thereon enabling the strip to be fed forward by forward movement of the table 7. Upon the table reaching its extreme forward position it pauses for an instant sufficient for the gripping unit 9 to release its grip on the strip 13, whilst at the same time the gripper unit 10 grips the strip and holds it while the table effects a return movement with the released gripper unit 9, it will thus be seen that by repeated reciprocatory cycles of the table 7 the strip is fed forward intermittently for the purposes of having a stamping, pressing or like operation performed thereon by a machine on which feeding means according to this invention is installed.

The impeller (Figures 10 to 12) is arranged

to have an infinitely variable stroke which is adjusted by means of the control knob 20 so that the extent of travel of the table 7 per cycle can be adjusted within limits to enable a feed of the strip 13 to be readily set in accordance with requirements and so enable the most economical use of the strip to be effected especially in stamping or pressing operations.

For each rotation of the impeller mechanism a complete feeding cycle of the table 7 is effected so that the impeller may be directly driven from the machine in order to operate the feeding means in correct timed relationship with the pressing, stamping or like operations of the machine.

The connection by means of the pipes 16, 17 between the impeller and the table unit enables feeding means according to this invention to be readily installed on various types of presses and like machines requiring intermittent feed of strip metal or similar stock for which purpose the pipes 16, 17 are preferably of copper or like ductile metal so that they may be readily bent in accordance with the requirements of a particular installation.

In cases where the stock to be fed consists of thin strip (i. e. less than .010" thick) two table units are preferably employed one each side of the press table or the like and operated in unison by a common impeller so that one table unit feeds the strip onto the press table whilst the other pulls the scrap strip off it, thus avoiding strip flexure or buckling which may be further avoided by arranging the table unit pulling the scrap strip to put a slight tension on the strip.

For supporting very thin strip (of the order of .005") against buckling, the movable gripper unit of each table unit may have a rearward extension constantly and slidably engaging a forward extension on the fixed gripper unit.

Describing now in detail with reference to Figures 1 to 9 the construction and operation of the table unit and gripper units 9, 10 thereon and the oil movement through the block 1 to the cylinders 3, 4 it is assumed that the table 7 has just reached its extreme return position in readiness to commence a feeding cycle, in which case the fixed gripper unit 10 is still closed and gripping the strip 13, whilst the movable gripping unit 9 is open.

In order to feed the table forward, oil movement takes place from the impeller (Figure 10) via the pipe 17, and vertical ducts 21 (Figure 4) and 22 in the block 1 and cylinder support 2 respectively, to the forward cylinder 3. However, before the piston 5 is moved by the oil to in turn move the table 7, the oil movement first takes place along a horizontal duct 23 (Figure 6) communicating the vertical duct 21 to one end of a small piston 24 to move the latter to the right. This causes displacement of oil from the bore of the block 1 in which the piston 24 operates into the horizontal duct 25 via the short duct 43, oil movement in said duct taking place in the direction towards the vertical duct 26 (Figure 2) and from thence to one end of a reduced portion 27 of the piston 18 causing the latter to move to the left and so actuate the separate hydraulic system controlling the gripper units.

When oil is displaced into the horizontal duct 25 it can only move in the direction above mentioned by reason of the fact that movement in the opposite direction i. e. to the left in Figure 6 is checked by the valve member 39 (Figure 2) until a predetermined oil pressure is reached, since the left hand end of the horizontal duct 25 communicates with the vertical duct 36 (Figure 9) which in turn communicates with the annular space 38 around the valve member 39 by means of the short horizontal duct 37. The valve member 39 is provided with a locally reduced part 40 (Figure 2) which allows passage of oil into the horizontal duct 41 when a predetermined oil pressure is reached sufficient to move the valve member 39 against its spring 51, the loading of which is set by the screw means 52.

It will also be noted that the vertical duct 36 (Figure 9) communicates with a horizontal duct 50 to enter the annular space 49 around the valve member 45, but this valve cannot be lifted in the manner of the valve member 39, and furthermore, a flat 43 (Figure 2) on this valve member permits passage of oil to the rear thereof, so that whatever the pressure of the oil supplied to the annular space 49 the valve member 45 is held on its seat by the oil passing to the rear of the valve member by the said flat 43.

The movement of the piston 18 to the left expels oil from the bore 53 in which it operates via the port 28 (Figure 5) and a flexible pipe 35 to the movable gripper unit 9 to cause the latter to grip the strip 13 as oil displacement due to movement of the piston 18 causes the space under the diaphragm 15 of the said gripper unit 9 to become filled with oil. At the same time the movement of the piston 18 causes oil to be drawn into its bore on the other side of said piston from the fixed gripper unit 10 via the duct 29 (Figure 3) in the bracket 33 supporting said gripper unit, the duct 30, the pipe 31 and port 32 (Figure 5).

In order to replenish the bore 53 in which the piston 18 (Figures 2 and 5) operates to compensate for any oil loss, the reservoir 19 communicates with the said bore 53 by means of a small vertical duct 54 (Figure 5) to an annular groove 55 in said bore.

It will, therefore, be seen from Figure 2 that the small piston 24 allows lost motion in the oil movement from the pipe 17 to the forward cylinder 3 to effect by simultaneous operation of the piston 18, a change of the gripping action of the gripper units on the strip 13 before the table 7 commences to move forward. The table 7 then moves forward moving with it the strip 13 gripped by the unit 9, which strip is drawn through the open fixed gripper unit 10.

As the table 7 moves forward oil is expelled from the return cylinder 4 owing to the return of the piston 6 therein, oil movement taking place down the vertical ducts 34 and 26 (Figure 4) in the cylinder support 2 and block 1 respectively and horizontal duct 25 (Figure 6) after which the oil movement continues up the vertical duct 36 (Figure 9) and via the horizontal duct 37 and is transferred to the annular space 38 around the spring loaded valve member 39. As already described the valve member 39 is provided with a locally reduced part 40 (Figure 2) which allows the oil above a predetermined pressure to move past the valve into the horizontal duct 41 to the vertical duct 42 which communicates directly with the pipe 16 to the impeller, the suction to the impeller during this phase of the cycle assisting the aforesaid oil movement through the block 1 from the return cylinder 4. Again as already described oil movement is not permitted from the duct 36 past the valve member 45.

Upon the table reaching its extreme forward movement the impeller reverses the oil movement and commences to force oil along the pipe 16 and withdraw same along the pipe 17. The return

movement of the oil along the pipe 16 via the block 1 and the return cylinder 4 is as follows:

The oil moves up the vertical duct 42 (Figure 2) where it is in contact with the other reduced end 44 of the piston 18 and also is in contact with the end of the spring loaded valve member 45. However, owing to the load set on this valve member by the setting of the screw means 46, compressing the spring 47 urging said valve member, movement of the piston 18 first takes place to displace oil to the fixed gripper unit 10 to cause it to grip the strip 13, whilst the movement of the piston 18 simultaneously effects withdrawal of oil from the moving gripper unit 9 to cause same to release the strip 13, the movement of the piston 18 also causing its reduced end 27 to effect oil movement down the duct 26 to the duct 25, where, by means of the short duct 48 (Figure 6) it acts upon the other end of the small piston 24 to return same to the position shown in Figure 6. Here again the lost motion afforded to the oil movement from the pipe 16 to the return cylinder 4 by the pistons 18 and 24, enables the gripping action of the gripper units to be changed over, whilst the table 7 is stationary before it starts its return movement.

After the piston 18 has thus effected its movement to change over the gripping action, pressure of the oil between the reduced end 44 and the valve member 45 is able to overcome the latter, so that oil movement takes place into the annular space 49 to pass into the horizontal duct 50 and down the vertical duct 36 (Figure 9) to the horizontal duct 25 which communicates with the return cylinder 4 via the vertical ducts 26 and 34 (Figures 2 and 4) to act upon the piston 6 for effecting return movement of the table 7.

Whilst the pressure of the oil moving up the duct 42 (Figure 2) eventually lifts the valve member 45 to allow oil to pass to actually effect return movement of the table 7, whatever the pressure of the oil in the duct 42 it is unable to lift the valve member 39 owing to the fact that a small bore duct 57 (Figure 7) is provided leading off the duct 42 to the rear of the valve member 39 so that the pressure of the oil holds the valve member 39 against its seating.

As the table 7 returns the piston 5 enters the forward cylinder 3 (Figure 1) expelling oil therefrom down the ducts 22, 21 (Figure 4) to the pipe 17 which oil movement is also assisted by the suction of the impeller in the pipe 17.

It will thus be seen that for each cycle of the impeller a complete feeding cycle is effected so that the speed of feed is dependant on the speed at which the impeller is driven, whilst the distance the strip 13 is fed per feeding cycle is dependant on the extent of oil movement to and fro via the pipes 16 and 17 and block 1 between the impeller and cylinders 3, 4 so that by varying the extent of oil movement the extent of feeding movement of the table 7 can be varied and so adjusted to suit requirements.

For this purpose the impeller is so arranged and constructed to enable a variable oil movement to be obtained. Referring to Figures 10, 11 and 12 the impeller comprises two pairs of plungers 60, 60 and 61, 61 operating in bushes 62 in the wall 63 of the impeller housing, the pair of plungers 60, 60 which operate together enter a chamber 64 communicating with the pipe 16, whilst in a similar manner the pair of plungers 61, 61 enter a chamber 65 communicating with the pipe 17, the ends of the plungers remote from said chamber are each provided with rollers 66 for

contact with pivoted members 67, 68 which are pivoted to support members or blocks 69, 70. These pivoted members 67, 68 each carry universally pivoted thereon shoes 71 bearing against the face of a swash plate or face cam 72 rotatably mounted in the cover 73 of the impeller housing and driven in any suitable manner in timed relationship with the machine.

The blocks 69, 70 have a screw threaded engagement with the threaded portions 74, 75 of the vertical shaft 76 rotatably mounted in the impeller housing and having secured to its upper end the aforesaid control knob 20. The threaded portions 74, 75 of this shaft are of opposite hand so that on rotation of the shaft the blocks 69, 70 are either moved apart or towards one another. Thus by manipulating the knob 20 the shoes 71 are either moved towards the centre of the face cam 72 to reduce the stroke of the plungers 60, 60 and 61, 61 so that the minimum of oil movement takes place along the pipes 16, 17 or said shoes 71 may be adjusted towards the periphery of the cam 72 to obtain maximum stroke of the plungers and consequent maximum movement of oil along the pipes 16, 17 to operate the table 7 for maximum feeding movement of the strip 13.

The ends of the plngers 60, 60, 61, 61 within the chambers 64, 65 respectively are bored at 77 (Figure 13) to receive compression springs 78 for abutment therein, the outer ends of the springs 78 abutting the wall 63 of the impeller housing in order to maintain the rollers 66 at the other ends of pistons in contact with the pivoted members 67, 68.

The housing of the pump containing the swash plate 72 and associated mechanism serves as a reservoir for oil at atmospheric pressure for the purpose of replenishing the two lines of oil under pressure between the impeller and the cylinders 3, 4 in order to make good any loss. For this purpose communication is effected between the housing of the pump and the chambers 64, 65 by means of automatic valves contained in at least one plunger 60 or 61 of each pair.

The automatic valve of one of the plungers 60 is shown in Figure 13 from which it will be seen that the roller 66 is carried by a forked head 80 having a shank 81 fitting in a bore 82 in the other end of the plunger 60, said shank having an axial through bore 83 therein.

Located in the bore 82 for limited sliding movement between the inner end of the shank 81 and the annular shoulder 84 in the plunger 60 is a valve member 85 the full diameter portion 86 of which is an oil tight sliding fit in the bore 82 and when in the position shown closes the inner end of the bore 83 in the shank 81 from the bore 77 and hence from communication with the chamber 64, the valve member 85 being urged to this position by pressure of oil thereon from said chamber.

However, upon a fall in oil pressure in the chamber 64 and as the piston 60 effects an outward suction stroke therein the suction on the valve member 85 moves it towards and against the annular shoulder 84 enabling oil to be inducted from the impeller housing through the bore 83 in the shank 81 and via the reduced portion 87 of the valve member 85 (which then registers with the annular groove 88 in the plunger) to the bore 77 and from thence into the chamber 64.

Inductance of oil through the above described automatic non-return valve in the plunger 60 is promoted by virtue of the fact that due to the

action of the swash plate 72 the plungers 60, 60, 61, 61 are not reciprocated at a constant speed. Thus after a quarter of the way through a feeding cycle when the swash plate has rotated through 90° the plungers 61 advancing into the chamber 65 to impel oil along the pipe 17 to the forward cylinder 3 advances a given distance but the plungers 60 receding from the chamber 64 to assist and accommodate return movement of oil from the pipe 16 have a slightly greater extent of movement creating a partial vacuum in the chamber 64 to assist inductance of oil through the plunger 60 that is fitted with the automatic valve.

Halfway through the cycle the extent of movement of the plungers 60, 60 equals that of the plungers 61, 61 and three quarters of the way through the cycle a similar accelerated movement of the plungers 61, 61 receding from the chamber 65 takes place to create a partial vacuum in the latter for promoting the desired oil inductance through an automatic valve in one of the plungers 61 identical with that described and shown in one of the plungers 60.

The arrangement of the annular groove 88 in relation to the reduced portion 87 of the valve member 85 is such that passage of oil is only permitted when the valve member is fully against the shoulder 84 otherwise too great a quantity of oil would tend to be inducted through the plunger.

I claim:

1. Automatic feed mechanism for power presses and like machines comprising in combination a base; a table mounted for reciprocatory movement on said base; hydraulically operated gripping means adapted to grip stock and mounted on said table for movement therewith; fixed hydraulically operated gripping means adapted to grip stock and mounted on said base so as to extend over the table in alignment with the movable gripping means on the latter; a pair of hydraulic rams mounted on said base and arranged to act in opposite directions on the table for imparting reciprocatory motion to the latter; a hydraulic impeller; a hydraulic system including two hydraulic fluid lines operatively connecting the impeller with the hydraulic rams for reciprocation of the table; a further hydraulic system comprising a piston arranged for operation by hydraulic fluid from at least one of the two fluid lines of the first mentioned hydraulic system which piston is adapted to displace fluid to one of the gripping means and withdraw fluid from the other and vice versa in order to alternately open and close the gripping means in timed relationship with the reciprocation of the table for effecting the automatic intermittent feed of stock to a machine; and a further piston arranged to be also operated on by fluid from the two hydraulic fluid lines of the first mentioned hydraulic system and in conjunction with the said piston of the hydraulic system for operating the gripping means, adapted to introduce lost-motion into the fluid movement along the two hydraulic fluid lines for the purposes of causing the table to pause at each extreme of its reciprocatory movement in order to enable the gripping action of the gripping means to be changed whilst the table is stationary.

2. Automatic feed mechanism for power presses and like machines comprising in combination a base; a table mounted for reciprocatory movement on said base; hydraulically operated gripping means adapted to grip stock and mounted on said table for movement therewith; fixed hydraulically operated gripping means adapted to grip stock and mounted on said base so as to extend over the table in alignment with the movable gripping means on the latter; a pair of hydraulic rams mounted on said base and arranged to act in opposite directions on the table for imparting reciprocatory motion to the latter; a variable stroke hydraulic impeller; a hydraulic system including two hydraulic fluid lines operatively connecting the impeller with the hydraulic rams for reciprocation of the table; a block assembly in said base having fluidways therein for connecting said fluid lines to the rams; a further hydraulic system comprising a piston slidable in a bore in said block assembly, said piston being arranged for operation by hydraulic fluid from one of said fluid lines through said fluidways in order to displace fluid from said bore to one of the gripping means and withdraw fluid from the other and vice versa so as to alternately open and close the gripping means in timed relationship with the reciprocation of the table for effecting the automatic intermittent feed of stock to a machine; and a further piston slidable in a bore in said block assembly and arranged to be also operated on by fluid from said fluid lines of the first mentioned hydraulic system through said fluidways and in conjunction with the said piston of the hydraulic system for operating the gripping means adapted to introduce lost-motion into the fluid movement along the two hydraulic fluid lines for the purposes of causing the table to pause at each extreme of its reciprocatory movement in order to enable the gripping action of the gripping means to be changed whilst the table is stationary.

3. Automatic feed mechanism for power presses and like machines comprising in combination a base; a table mounted for reciprocatory movement on said base; hydraulically operated gripping means adapted to grip stock and mounted on said table for movement therewith; fixed hydraulically operated gripping means adapted to grip fixed stock and mounted on said base so as to extend over the table in alignment with the movable gripping means on the latter; a pair of hydraulic rams mounted on said base and arranged to act in opposite directions on the table for imparting reciprocatory motion to the latter, cylinders of said rams forming guides on which the table can slide for reciprocatory movement; a variable stroke hydraulic impeller; a hydraulic system including two hydraulic fluid lines operatively connecting the impeller with the hydraulic rams for reciprocation of the table; a block assembly in said base having fluidways therein for connecting said fluid lines to the rams; a further hydraulic system comprising a piston slidable in a bore in said block assembly, said piston being arranged for operation by hydraulic fluid from one of said fluid lines through said fluidways in order to displace fluid from said bore to one of the gripping means and withdraw fluid from the other and vice versa so as to alternately open and close the gripping means in timed relationship with the reciprocation of the table for effecting the automatic intermittent feed of stock to a machine; spring loaded valve means in said block assembly for controlling the direction and pressure of fluid movement in the fluidways for conducting fluid from the said one of said fluid lines to said piston; and a further piston slidable in a bore in said block assembly and arranged to be also operated on by fluid from said fluid lines

of the first mentioned hydraulic system through said fluidways and in conjunction with the said piston of the hydraulic system for operating the gripping means adapted to introduce lost-motion into the fluid movement along the two hydraulic fluid lines for the purposes of causing the table to pause at each extreme of its reciprocatory movement in order to enable the gripping action of the gripping means to be changed whilst the table is stationary.

4. A step by step feeding device for feeding sheet material with a step by step motion, said device comprising a stationary material support, a reciprocable material support, a primary pressure fluid instrumentality including a pressure fluid pump for reciprocating said reciprocable support, and a pressure fluid actuated clamp mounted on each support, one of said clamps being reciprocable with said reciprocable support, in combination with a secondary self-contained sealed unit pressure fluid instrumentality including a free action type reciprocating piston, a cylinder in which said piston reciprocates, conduit means connecting said clamps with said cylinder on opposite sides of said piston, and an axial rod medially of which said piston is rigidly mounted, the respective ends of said rod being of reduced diameter with respect to the corresponding operative face of said piston and being successively subjected to the pressure of the fluid of said primary pressure fluid instrumentality to alternately move said piston in opposite directions to alternately supply fluid under pressure to, and withdraw fluid from, said clamps at the end of each step by step movement of said reciprocable support and before the initiation of the succeeding step by step movement thereof, whereby the reciprocable support will remain at a standstill while the fluid is being forced to one clamp and being withdrawn from the other clamp and until the space occupied by the displaced portion of the piston rod has been filled with oil when the initiation of the next step by step movement will take place.

5. A step by step feeding device for feeding sheet material with a step by step motion, said device comprising a stationary material support, a reciprocable material support, a primary pressure fluid instrumentality for reciprocating said reciprocable support, and a pressure fluid actuated clamp mounted on each support, one of said

clamps being reciprocable with said reciprocable support, in combination with a secondary self-contained sealed unit pressure fluid instrumentality including a reciprocating piston, a cylinder in which said piston reciprocates, conduit means connecting said clamps with said cylinder on opposite sides of said piston, and an axial rod medially of which said piston is rigidly mounted, the respective ends of said rod being of reduced diameter with relation to the corresponding operative faces of said piston and being successively subjected to the pressure of the fluid of the primary pressure fluid instrumentality to alternately move said piston in opposite directions to alternately supply fluid under pressure to, and withdraw fluid from, said clamps.

6. A step by step feeding device for feeding sheet material with a step by step motion, said device comprising a stationary material support, a reciprocable material support, a primary pressure fluid instrumentality for reciprocating said reciprocable support, and a pressure fluid actuated clamp mounted on each support, one of said clamps being reciprocable with said reciprocable support, in combination with a secondary pressure fluid instrumentality including a double acting secondary system pump and conduit means connecting said clamps with said pump, said pump having portions successively subjected to the pressure of the fluid of said primary pressure fluid instrumentality to operate said pump to alternately supply fluid under pressure to, and withdraw fluid from, said clamps at the end of each step by step movement of said reciprocable support and before the initiation of the succeeding step by step movement thereof, whereby the reciprocable support will remain at a standstill while the fluid is being forced to one clamp and simultaneously is being withdrawn from the other clamp.

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