April 2, 1963 W. V. KENNEDY 3,083,752

MANUFACTURE OF METAL SPOOLS

Filed May 31, 1961 2 Sheets-Sheet 1

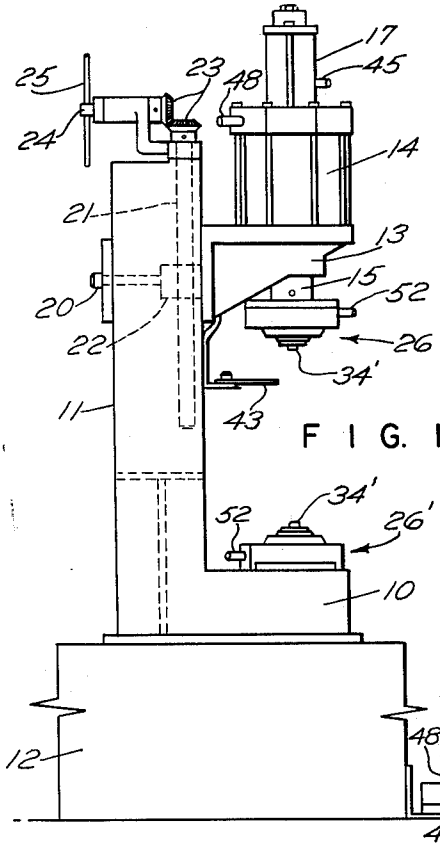


FIG. 1

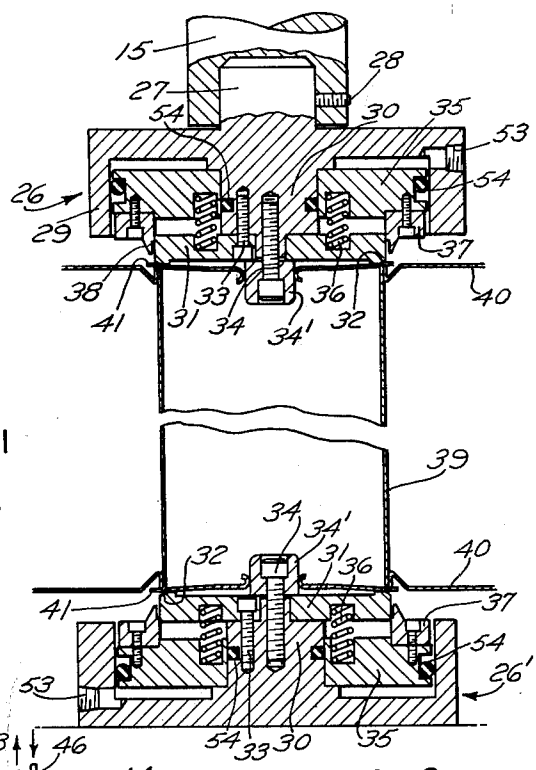


FIG. 2

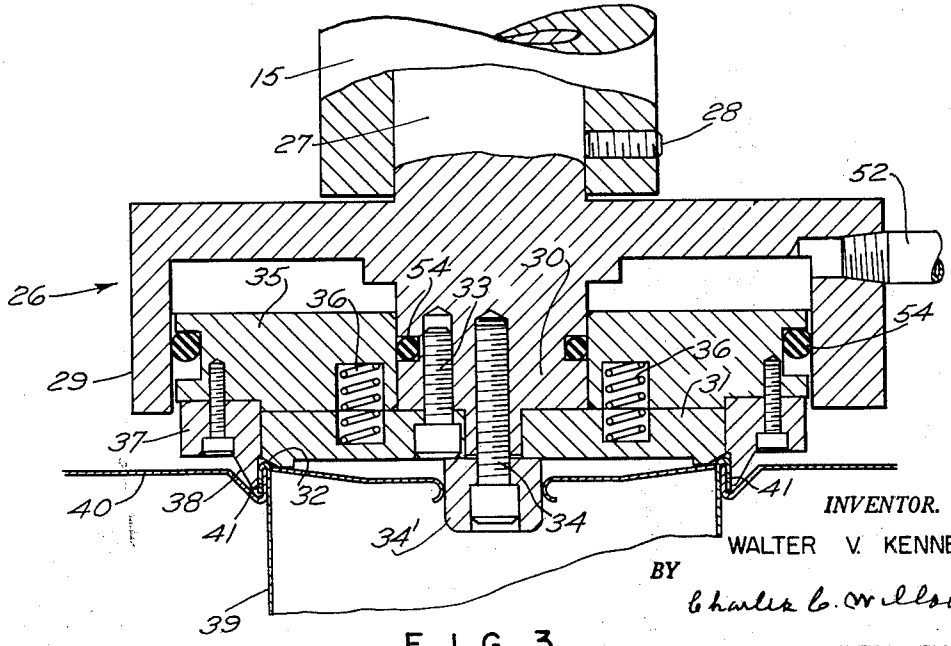


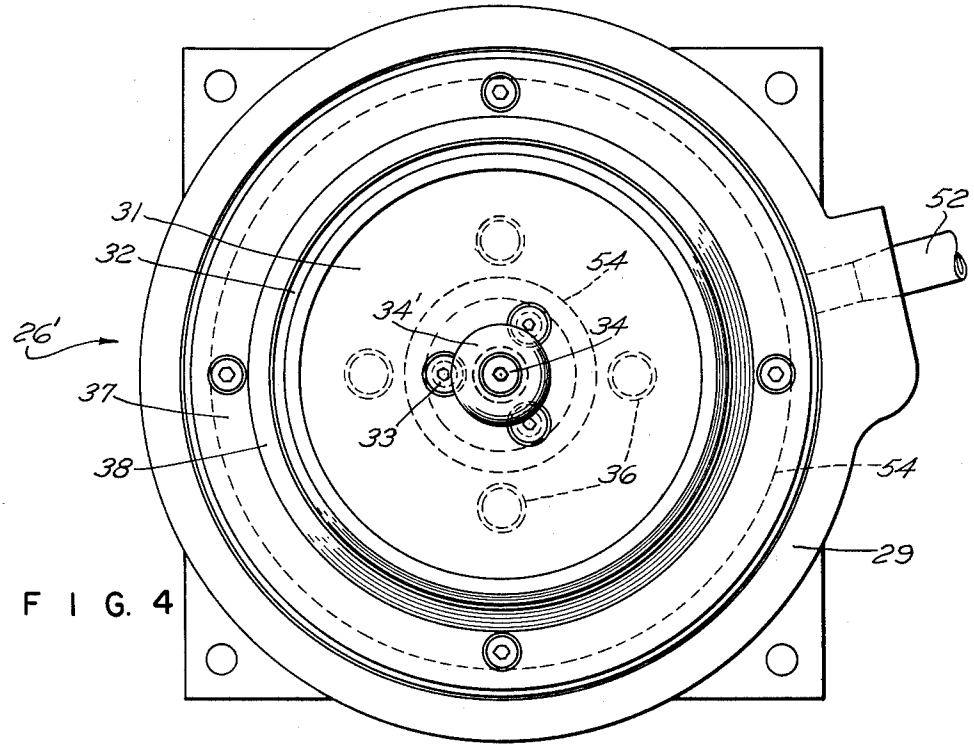
FIG. 3

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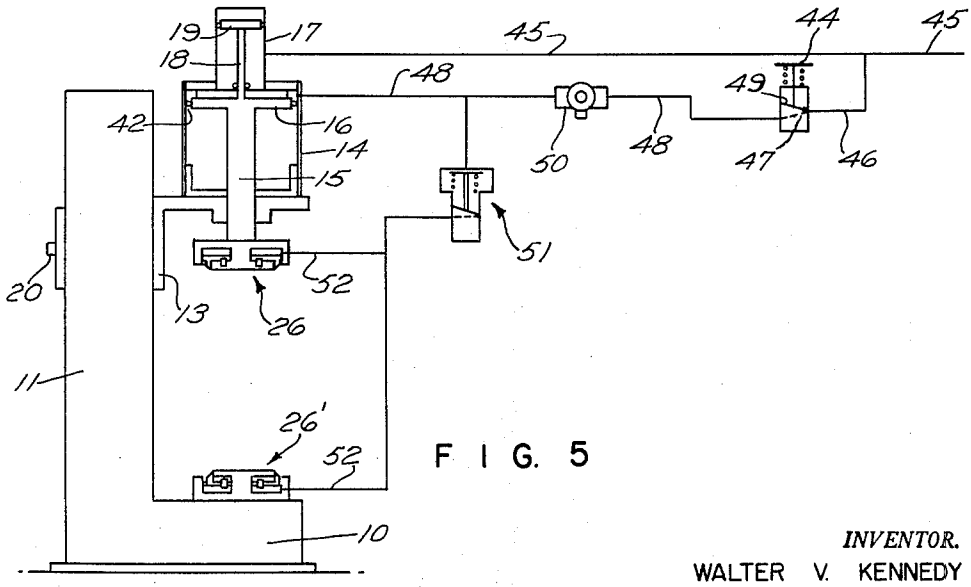
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F I G. 4



F I G. 5

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MANUFACTURE OF METAL SPOOLS

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1 Claim. (Cl. 153—13)

This invention relates to the manufacture of metal spools and more particularly to a composite die for firmly securing metal heads to the ends of the spool barrel.

In my Patent No. 2,824,707 there is shown, described and claimed a sheet metal spool having a tubular barrel with projecting tabs at its ends, and a head for each end of the barrel that is slotted to receive the projecting tabs. In accordance with the disclosure of such patent the tabs are first bent outwardly over the spool head and then the tab end portions are bent inwardly toward the barrel to firmly secure the head in place.

For best results, two dies are used; one to bend the tabs outwardly over the spool head and the other to bend the tabs into approximately parallel relation with the wall of the barrel.

These two dies should operate in proper time sequence so that the first die travels the proper distance to bend the tabs laterally in contact with a portion of the head, and then the second die operates to bend the tabs into close parallel relation with the barrel to thereby firmly secure the head to the barrel. Both spool heads are preferably secured to the barrel at the same time.

Having in mind the foregoing, the present invention relates to a spool assembly press having a composite die constructed, whereby the press die is actuated to bend the barrel tabs to an intermediate position in firm engagement with a portion of the spool head, and then a ring die which surrounds the press die is pneumatically operated to force the tabs to their final position in parallel relation with the barrel wall. By the use of such pneumatic means the ring die is actuated in proper time sequence with the other die.

The above and other features of the present invention will be further understood from the following description when read in connection with the accompanying drawings, wherein:

FIG. 1 is a side elevation of a press provided with the die mechanism contemplated by the present invention.

FIG. 2 on a larger scale is a vertical sectional view through a spool and the movable and fixed die heads of the present invention.

FIG. 3 is a further enlarged vertical section of the movable or upper die head of FIG. 2.

FIG. 4 is a top view of the lower die head shown in FIG. 2; and

FIG. 5 is a diagrammatic view showing the press of FIG. 1 with parts in section, and the air pressure lines and air valves in diagram.

The present invention resides in the construction and operation of the die head or die heads. It is preferred to employ a movable die head and a fixed die head of similar construction. These die heads may be used upon various types of die presses. The press shown in the drawings comprises a metal base 10 having the upright portion 11. This die press may be mounted on a support or table 12. To the upright 11 is secured the sliding frame 13 to which is rigidly secured a cylinder 14 in which is slidably mounted a piston or ram 15. To the upper end of this ram is secured a piston head 16 (see FIG. 5).

Extending upwardly from the cylinder 14 is a small auxiliary cylinder 17 containing the piston 18 having the piston head 19 attached thereto, and this piston 18

is rigidly secured to the upper end of the ram 15. The sliding frame 13 is adjustably secured to the upright 11 by the clamping bolt or bolts 20. In order to raise or lower the sliding frame 13 to accommodate the height of the spool, there is provided the threaded shaft 21 which threadedly engages a nut portion 22 rigidly secured to the frame 13. This threaded shaft may be rotated by the meshing gears 23 secured at the upper end of the upright 11, and these gears are rotated by the horizontally extending shaft 24 having projecting therefrom the bar 25 for rotating this shaft and the gears 23.

To the lower end of the ram 15 is removably secured the die head 26 which is shown as having the upwardly extending stub shaft 27 that fits in the bore at the lower end of the ram 15 and is rigidly secured to the ram by the set screw 28. This head 26 has the downwardly extending annular skirt 29 and a central downwardly extending boss 30. To the lower end of this boss 30 is rigidly secured the annular die member 31 having the annular outer portion 32 which engages and bends the spool tabs outwardly in a manner to be described. This annular die member 31 is rigidly secured to the boss 30 by the bolts 33. A center bolt 34 serves to secure the annular centering pin 34′ in place. Within the annular opening surrounded by the skirt 29 is slidably mounted the auxiliary head 35. This head is normally held in its raised or retracted position in which it is shown in FIG. 2 by the coiled springs 36. To this head 35 is bolted a ring die 37 having the annular rib 38 adapted to engage and bend the spool tabs to their final position, as will be apparent from FIG. 3 wherein the die head 35 and die ring 37 are shown in their lower or extended position.

The lower or fixed die head 26′ may be identical in construction to the upper die head 26 just described, except that the lower die head is rigidly secured to the base 10 of the press. In the operation of the press so far described, having the movable die head 26 and fixed die head 26′, a metal spool which may be similar to that shown and described in my above cited patent is placed in position to be operated upon by the press. That is, a metal spool barrel such as indicated by 39 and having end tabs projecting therefrom is provided with the heads 40 which are slotted as shown in said patent to receive the projecting tabs, then the spool comprising the barrel 39 having the heads 40 frictionally secured thereto by the projecting tabs is placed on the lower die head 26′ as shown in FIG. 2 so that the centering pin 34′ enters the central bore of the head 40. Then when the spool is held in a vertical position, for example, so that the center hole in the upper head 40 is in alignment with the upper centering pin 34′, the ram 15 may be lowered to the end of its downward stroke so that the upper die portion 32 and lower die portion 32 will simultaneously bend the barrel tabs outwardly to their horizontal position as indicated by 41 in FIG. 2.

While the ram 15 is held in its downward position in which it is shown in FIG. 2, the auxiliary die members 37 are forced, by means to be described, to the position in which the upper die ring is shown in FIG. 3 to thereby bend the tabs 41 downwardly into parallel relation with the barrel 39 as shown in FIG. 3. This movement of the two annular die rings takes place simultaneously at both the upper and lower ends of the metal spool to thereby firmly secure both heads of the spool to the barrel 39. This completes the operation of securing the heads to the barrel.

The movement of the ram 15 is preferably effected pneumatically by introducing air from an air pressure line to the space between the head at the upper end of the cylinder 14 and the piston head 16 slidably mounted

in such cylinder, this piston head is shown as having at its outer periphery the sealing O-ring 42. When the metal spool above described has been placed on the lower die head 26' and properly aligned with the upper die head by engaging the barrel 39 of this spool with a positioning bracket 43, a foot pedal such as indicated by 44 is operated to open a valve and admit air under pressure to the upper end of the cylinder 14 so that this air pressure will force the ram downwardly to the end of its downward stroke. This pressure is employed to hold the ram fully depressed until the auxiliary die members have been pneumatically operated in a manner to be described, to complete the tab bending operation.

Now, referring to the diagram of FIG. 5, the main air pressure line is indicated by 45 and it will be noted that this line 45 is connected directly to the bore of the smaller cylinder 17 so that a constant air pressure is maintained in this cylinder and against the lower face of the piston 19 therein. The purpose of this is to raise the ram 15 as soon as air is permitted to exhaust from above the main piston head 16. In this manner the ram 15 is normally held in its raised or retracted position as shown in FIG. 5. The air pressure in the line 45 may be about 80 pounds per square inch.

Leading from the main air line 45 is the auxiliary line 46 which is controlled by a valve 47 that is opened by the foot pedal 44. This pedal 44 may be replaced by a hand lever. The valve 47 is shown in FIG. 5 as in its closed position, and while in this position the pipe line 48 leading from this valve to the cylinder 14 is opened so that air may exhaust therefrom. When the foot pedal 44 is depressed it opens the valve 47 to move the element 49 downwardly to the dotted position so that the air pressure from the line 45 is supplied to the pipe line 48 and to the cylinder 14. In order to speed up operation of the press, it is desirable to provide means whereby when the operation on a metal spool is completed, air may be quickly exhausted from the cylinder 14. It is therefore desirable to provide in the line 48 the quick exhaust valve 50 which may be of well-known construction and contains a diaphragm that normally holds this exhaust valve closed. Pressure is maintained in the line 48 throughout the tab bending operations. When the operator permits the pedal 44 to rise the element 49 will move to its full line position. This relieves the pressure in the pipe 48 whereupon the diaphragm just mentioned will open the exhaust valve 50.

An important feature of the present invention resides in the time sequence operation whereby the auxiliary die head 35 remains in its retracted position until the ram has completed its downward stroke and engages a stop. At this instant the pressure within the cylinder 14 rises to approximately that of the line pressure 45. This increase in pressure serves to open a sequence valve 51 which controls the pipe lines 52 leading to the upper die head 26 and lower die head 26'. The upper pipe line 52 is connected to the threaded inlet 53 of the head

26 to thereby admit air under pressure to the space between the movable head 35 and inner wall of the head 26. The second air line 52 is similarly connected to the lower head 26'. Each movable head 35 is provided with the sealing O-rings 54.

In operating the press above described, a spool having a head frictionally held at each end thereof by the projecting tabs is placed on the lower die head 26' as shown in FIG. 2 in proper alignment with the upper die head 26. Then the foot pedal 44 is depressed to admit air to the cylinder 14 and force the ram 15 down to the end of its stroke. This will bend the upper tabs and lower tabs outwardly to a horizontal position against the spool heads. As soon as the ram reaches the end of its downward stroke, the sequence valve 51 will be forced open to admit compressed air to the die heads 26 and 26' and actuate the ring dies 37 to bend the tabs to their final position while the valve 47 is held open by the press operator. It is important that the downward pressure on the ram 15 and head 16 be greater than the pressure exerted in the opposite direction by the air pressure on the auxiliary heads 35. As soon as the foot is removed from the pedal 44 the valve 47 closes and opens the line 48 to exhaust air from above the piston head 16 and from the auxiliary die heads, and allow the ram 15 and heads 35 to return to their retracted positions.

It will be seen from the foregoing that by employing the air pressure means herein described the desired amount of pressure will be exerted on the ram 15 and the ring dies 37, and that the ring dies will not operate until the die members 31 have completed their operation. This insures the proper time sequence operation of the ring dies, and rapid operation of the press.

I claim:

In the manufacture of metal spools having a tubular barrel with projecting tabs at its ends and a head for each end of the barrel that is slotted to receive the projecting tabs, a spool assembly press provided with a base and a sliding ram, two main die heads each having an attached die for bending the tabs simultaneously outwardly over each spool head, one die head being mounted on said base and the other carried by the ram, an auxiliary head carried by each main die head and each such auxiliary head having a ring die rigidly secured thereto and movable relatively to its main die to bend the tabs to their final position, pneumatic means for moving the ram toward the barrel and causing the main dies to bend all tabs simultaneously outwardly at each end of the barrel, and additional pneumatic means associated with each ring die and operable upon the build-up of pneumatic pressure on the ram at completion of its stroke to actuate the ring dies to force the tabs to their final position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,111,566 Link ---------- Mar. 22, 1938
2,159,900 Le Jeune et al. ---------- May 23, 1939