

June 16, 1959

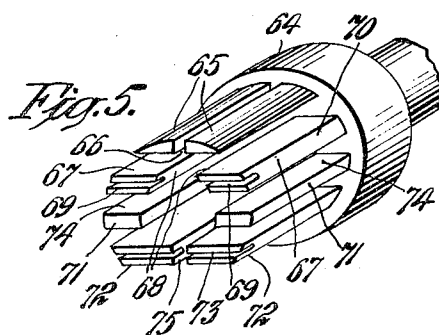
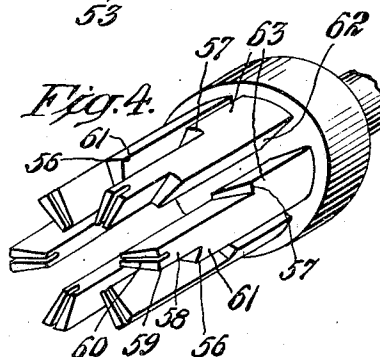
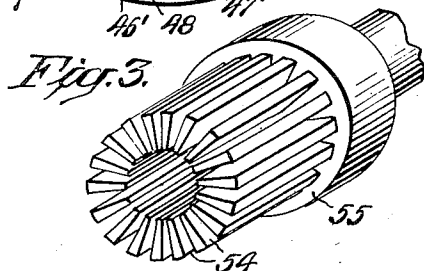
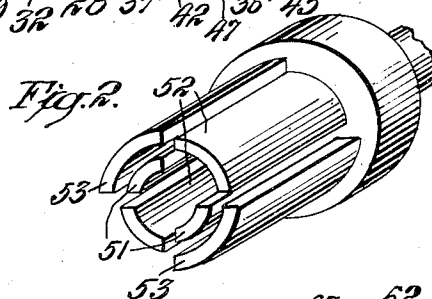
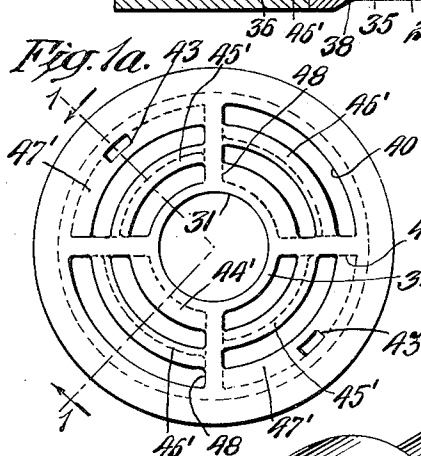
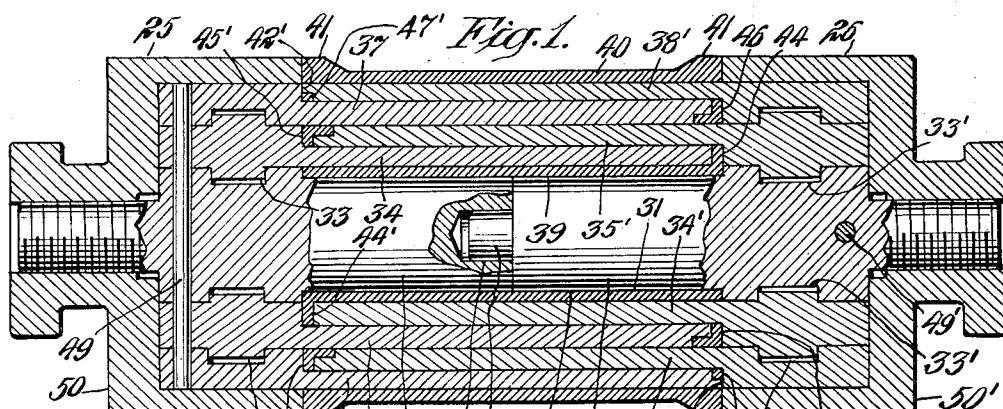
L. H. MORIN

2,890,490

DIE AND CORE STRUCTURES FOR PRODUCING MOLDED SPOOL BODIES

Filed June 22, 1953

6 Sheets-Sheet 1



INVENTOR.
LOUIS H. MORIN

BY *Harold E. Thompson*
ATTORNEY

June 16, 1959

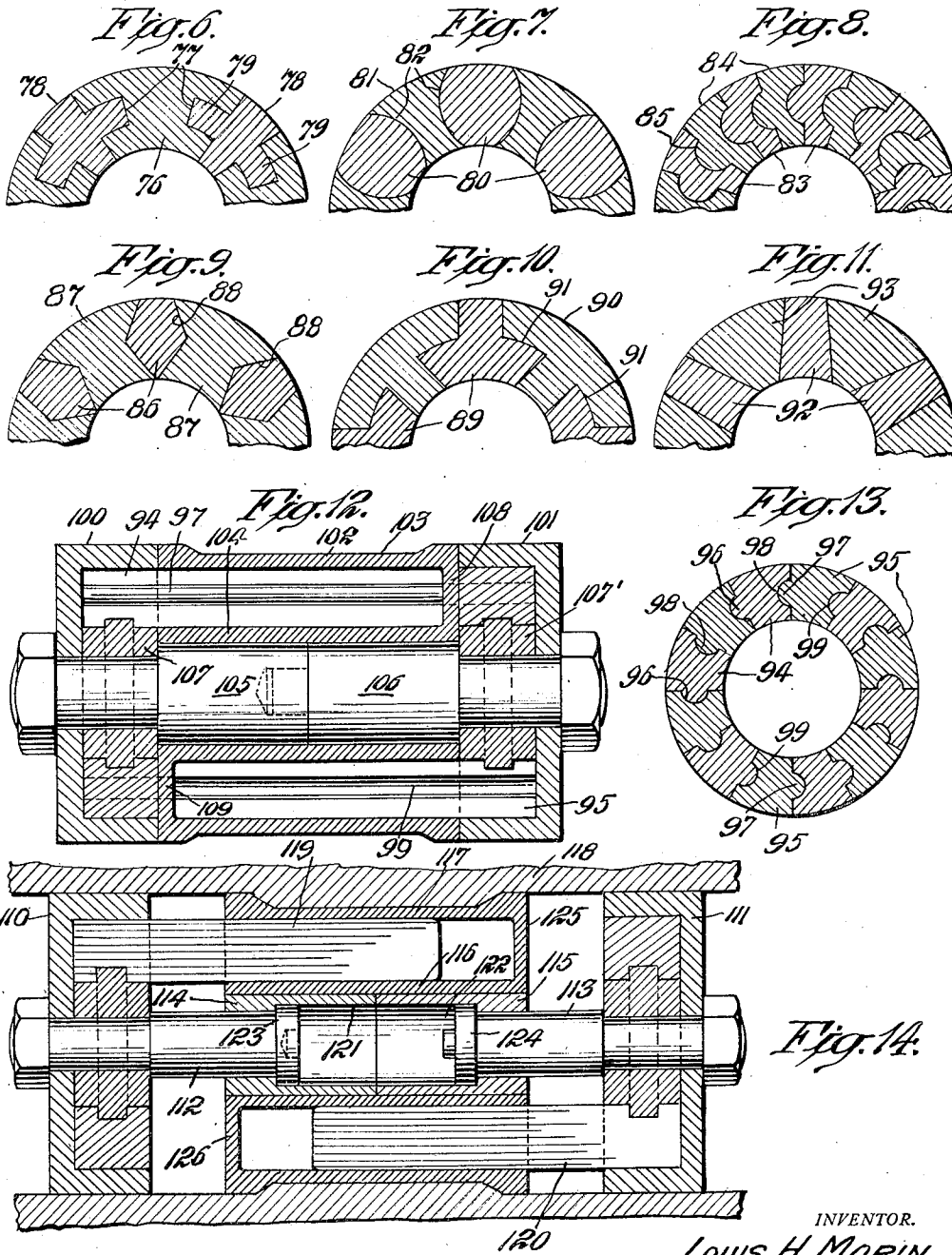
L. H. MORIN

2,890,490

DIE AND CORE STRUCTURES FOR PRODUCING MOLDED SPOOL BODIES

Filed June 22, 1953

6 Sheets-Sheet 2



INVENTOR.

LOUIS H. MORIN

BY *Harold Thompson*
ATTORNEY

June 16, 1959

L. H. MORIN

2,890,490

DIE AND CORE STRUCTURES FOR PRODUCING MOLDED SPOOL BODIES

Filed June 22, 1953

6 Sheets-Sheet 3

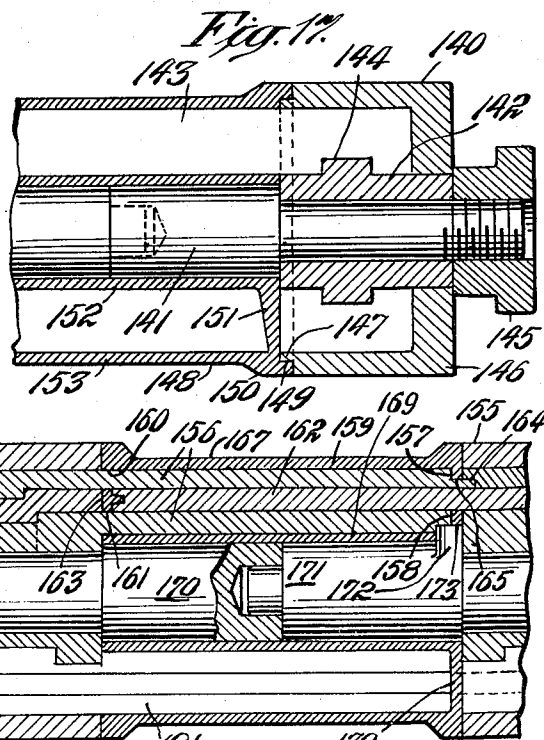
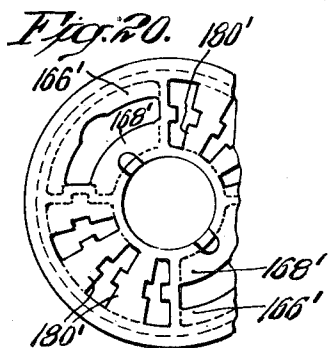
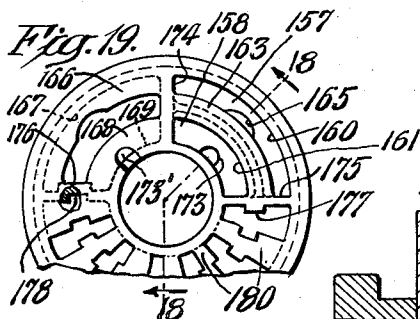
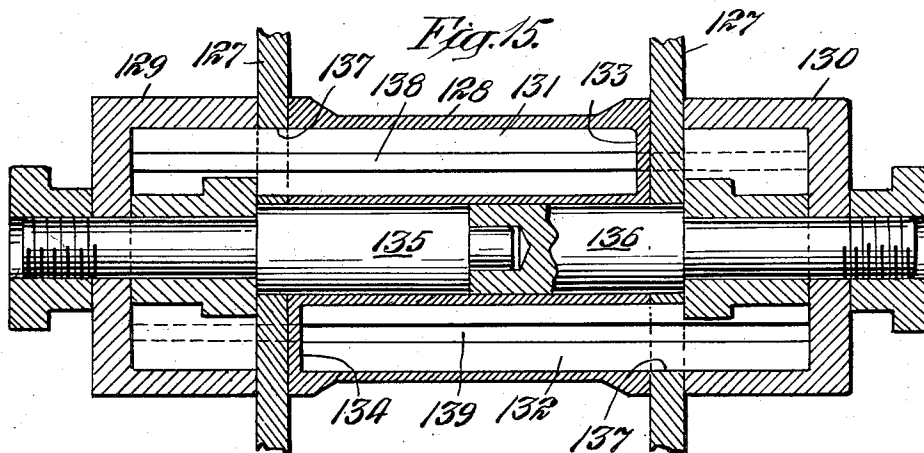


Fig. 18. LOUIS H. MORIN

BY *Harold Thompson*
ATTORNEY

June 16, 1959

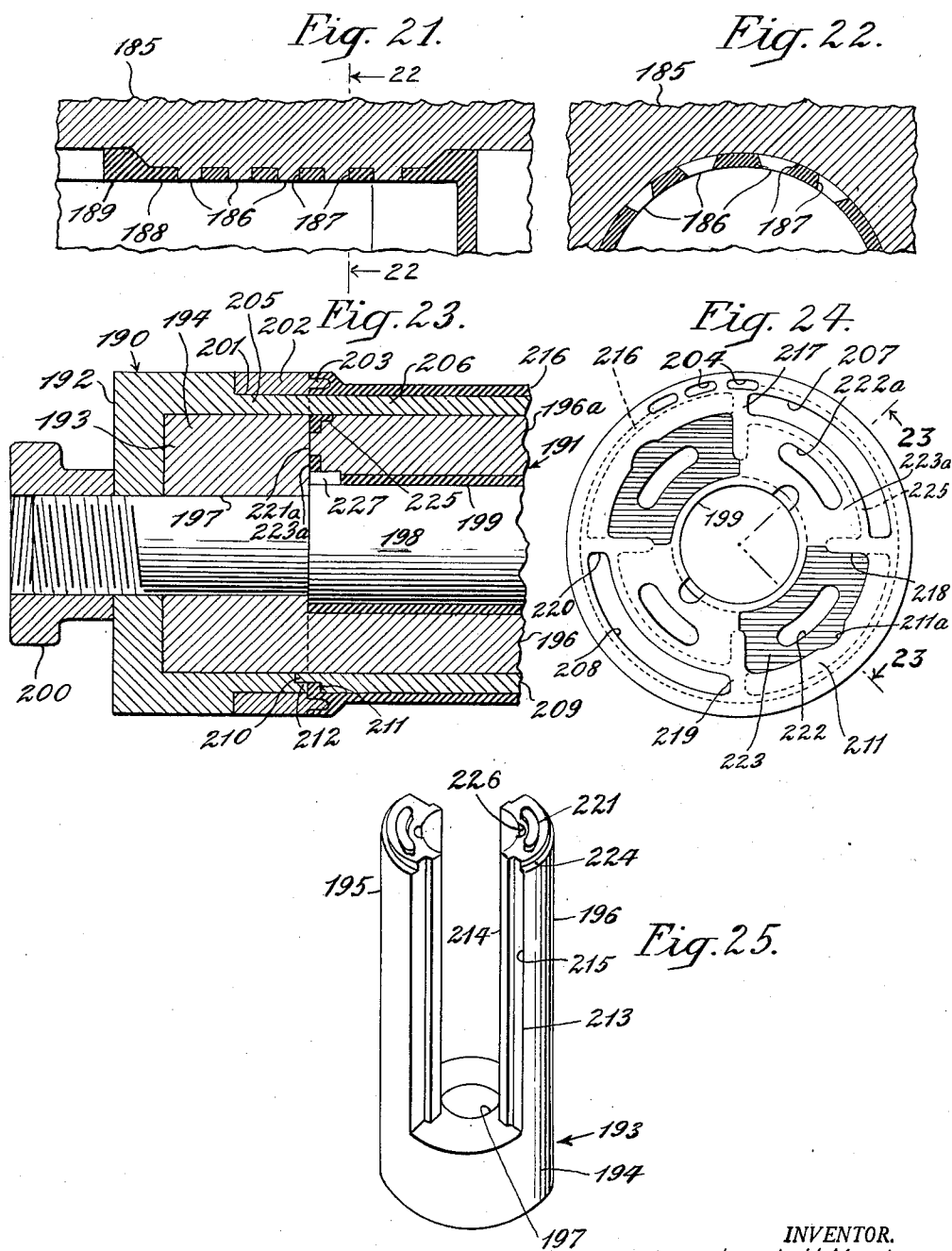
L. H. MORIN

2,890,490

DIE AND CORE STRUCTURES FOR PRODUCING MOLDED SPOOL BODIES

Filed June 22, 1953

6 Sheets-Sheet 4



INVENTOR.
Louis H. Morin

BY

Howard E. Thompson
ATTORNEY

June 16, 1959

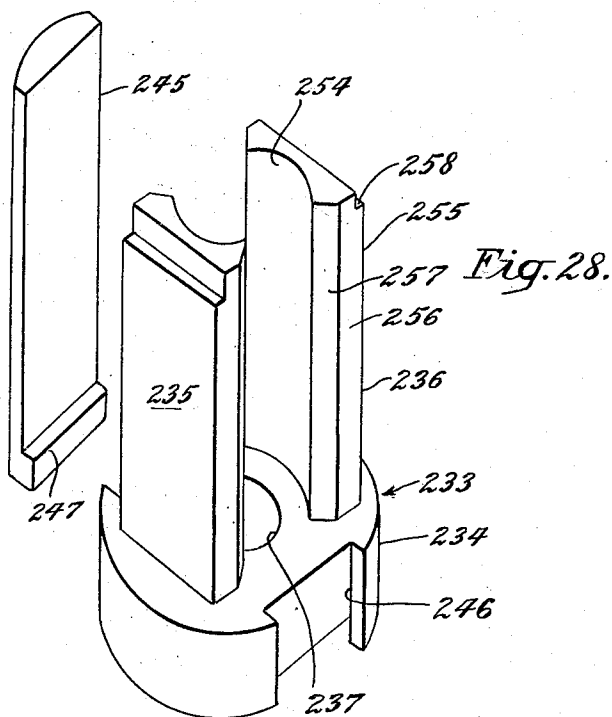
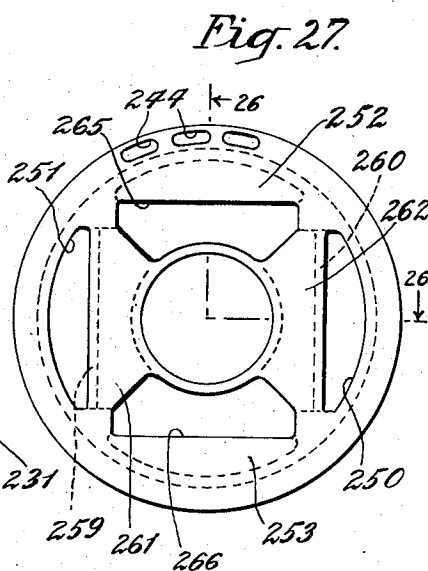
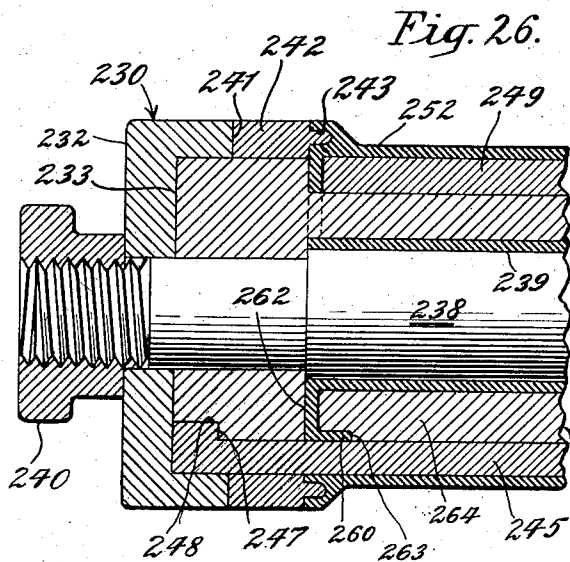
L. H. MORIN

2,890,490

DIE AND CORE STRUCTURES FOR PRODUCING MOLDED SPOOL BODIES

Filed June 22, 1953

6 Sheets-Sheet 5



INVENTOR.
Louis H Morin

BY
Howard E. Thompson
ATTORNEY

June 16, 1959

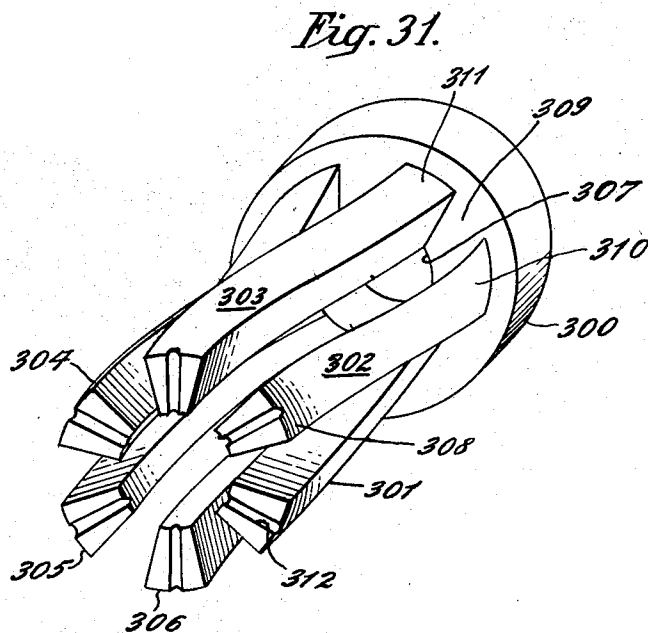
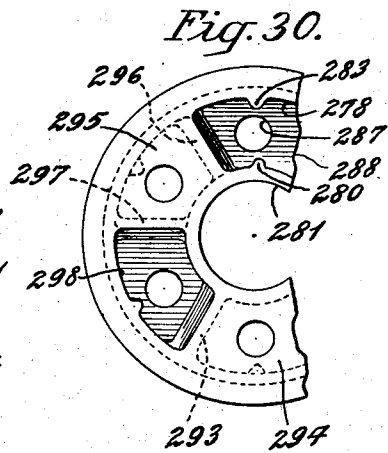
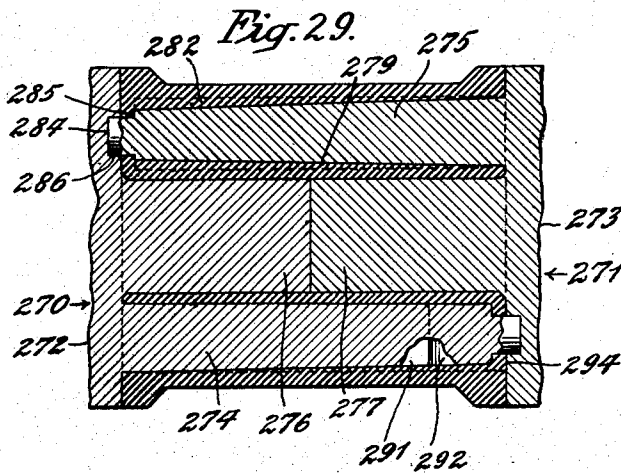
L. H. MORIN

2,890,490

DIE AND CORE STRUCTURES FOR PRODUCING MOLDED SPOOL BODIES

Filed June 22, 1953

6 Sheets-Sheet 6



INVENTOR.
Louis H. Morin

BY
Harold E. Thompson
ATTORNEY

1

2,890,490

DIE AND CORE STRUCTURES FOR PRODUCING MOLDED SPOOL BODIES

Louis H. Morin, Bronx, N.Y., assignor to Coats & Clark, Inc., New York, N.Y., a corporation of Delaware

Application June 22, 1953, Serial No. 363,364

14 Claims. (Cl. 18—45)

This invention relates to the formation of molded spools commonly referred to as thread spools and particularly products of this type and kind molded from plastics. Still more particularly, the invention deals with a novel core construction for the dies or molds employed, wherein pairs of interfitting cores are employed in forming hollow spool bodies defined primarily by inner and outer tubes integrally joined at ends of the spool body in end wall portions which collectively form end surfaces for attachment of labels to the ends of the spool body.

Further, the invention deals with core structures including means for supporting the parts thereof one with respect to the other to withstand the pressure of injection of the molded material in forming the molded spool bodies. Still more particularly, the invention deals with a die and core construction wherein stripper plates are employed for stripping the molding product from the cores in the operation of withdrawing the cores from the molded spool.

The novel features of the invention will be best understood from the following description when taken together with the accompanying drawing, in which certain embodiments of the invention are disclosed, and in which the separate parts are designated by suitable reference characters in each of the views, and in which:

Fig. 1 is a longitudinal sectional view through one form of core structure which I employ illustrating a molded spool body formed thereby, the section being on the broken line 1—1 of Fig. 1a;

Fig. 1a is an end view of the molded spool body formed from the core structure shown in Fig. 1;

Fig. 2 is a perspective view of one core employed for molding a simplified form of spool body generally of the character disclosed in Fig. 1a;

Figs. 3 to 5 inclusive are views similar to Fig. 2 showing one core for producing other modified forms of spool bodies;

Figs. 6 to 11 inclusive are cross sectional views through the interfitting portions of two cores for producing other forms of spool bodies;

Fig. 12 is a view similar to Fig. 1 showing another form of core construction with part of the structure shown in elevation;

Fig. 13 is a cross sectional view through the interfitting cores employed in the showing of Fig. 12;

Fig. 14 is a view similar to Figs. 1 and 12 showing another form of coring and method of operation of the cores;

Fig. 15 is a view similar to Figs. 1, 12 and 14 illustrating the use of stripper plates in stripping the cores from the molded product;

Fig. 16 is a sectional view through a part of the interfitting cores employed in the structure shown in Fig. 15;

Fig. 17 is a view similar to Fig. 15 omitting the stripper plates, showing only one side of the core structure and indicating the formation of a recessed end in the molded spool body;

Fig. 18 is a broken section through another modified

2

form of coring which I employ, the section being on the line 18—18 of Fig. 19;

Fig. 19 is a partial end view of a spool made from the coring shown in Fig. 18;

Fig. 20 is a view similar to Fig. 19 showing a spool made from a further modified form of coring generally of the type and kind disclosed in Fig. 18;

Fig. 21 is a partial cross-sectional view showing a mold or die with which the present cores may be used, parts of the construction being omitted;

Fig. 22 is a sectional view along the line 22—22 of Fig. 21;

Fig. 23 is a partial cross-sectional view of another form of cores;

Fig. 24 is an end view of a thread spool made by the cores of Fig. 23;

Fig. 25 is a perspective view of one of the core units of Fig. 23;

Figs. 26, 27 and 28 are views similar to Figs. 23, 24 and 25, respectively, but showing a modified core;

Figs. 29 and 30 are views similar to Figs. 23 and 24, respectively, and showing another modification; and

Fig. 31 is a view similar to Figs. 2, 3, 4, or 5 and showing another modified core unit.

To illustrate one general adaptation of the core structure and mounting thereof, I have illustrated in Fig. 1 of the drawing a sectional view through a pair of cores shown in closed relationship to each other and indicated in section the formation of a molded spool thereon, an end view of the spool shown in Fig. 1a being illustrated in Fig. 1a, the section of Fig. 1 being on the broken line 1—1 of Fig. 1a in order to illustrate sections through two different end wall portions of the spool.

In Fig. 1, 25 and 26 diagrammatically show two cores or core units, each having a center pin portion 27, 28 interfitting for alignment by a reduced pin 29 on 28 entering a socket 30 in 27. The pins 27 and 28 form the bore 31 of the inner tube 32 of the resulting spool. Keyed to the pin 27, as seen at 33, are two circumferentially spaced curved core elements or fingers 34, one only of these fingers being illustrated in Fig. 1. At right angles to the fingers 34, the pin 27 similarly supports two other fingers 35, again only one of which is shown in Fig. 1, the latter fingers being spaced outwardly with respect to the fingers 34. The pin 28 supports two curved fingers 34' similar to the fingers 34 and assuming the same radial position and spaced between the fingers 34. The pin 28 further supports fingers 35' which have the same position and arrangement with respect to the fingers 35 as do the fingers 34'. The fingers 34' and 35' are keyed to the pin 28 as indicated at 33'.

Supported on and keyed to the fingers 34, 35 and 34', 35' as seen at 36, 36' are other pairs of fingers 37, 38, 37', 38'. Here again, the fingers 37, 37' are in circumferential spaced alignment, which is also true of the fingers 38, 38'. The fingers 34, 34' are spaced with respect to the outer surfaces of the pins 27 and 28 to form an annular cavity 39 in which the inner tube 32 of the spool is formed. Then all of the fingers collectively form a substantially cylindrical body, upon the outer surface of which the outer tube 40 of the resulting spool is formed. The mold in which the cores operate, and which is not shown, is fashioned to form the outer surface of the outer tube 40 as well as the annular end rims 41 thereon.

It will be noted from a consideration of Fig. 1 of the drawing that all of the core elements or fingers terminate short of the end of the mold cavity in which the spool is formed, with the exception of the elements 38, 38' which have reduced extensions as seen at 42, 42' to abut outer ends of the elements 37, 37' respectively in establishing a stop checking inward closing movement of the

3

cores 25, 26 one with respect to the other, thus facilitating support of the elements under pressure to resist injection pressure of the molding material employed. This construction forms at ends of the spool small openings as indicated at 43, thus it will be apparent that the extensions 42, 42' are not the full circumferential dimensions of the elements 38 and 38'.

By terminating the ends of the elements in the manner above stated, end wall portions are formed on the resulting spool. For example, at the end of the elements 34 will be formed curved end walls, one of which is shown at 44 at the right of Fig. 1 of the drawing, whereas at the ends of the elements 34' are formed walls 44' shown clearly in Fig. 1a of the drawing. At the ends of the elements 35 will be formed ribbed walls 45, one of which is seen at the right of Fig. 1 of the drawing. Corresponding ribbed walls 45' are formed at the ends of the elements 35' and two of these walls are shown in Fig. 1a of the drawing. Corresponding ribbed walls 46 are formed at the ends of the elements 37, one of such walls being indicated at the right of Fig. 1, and similar ribbed walls 46' are formed at the ends of the elements 37', and two of the latter are shown in Fig. 1a of the drawing. At the ends of the elements 38 are formed end walls 47, one of which is indicated at the right of Fig. 1 in which walls of the apertures as at 43 are formed, and corresponding end walls 47' are formed at the ends of the elements 38', the latter being shown in Fig. 1a of the drawing.

It will be apparent that the respective elements are movable through the openings formed between the several end walls, as shown in Fig. 1a of the drawing, in the separation of the cores one with respect to the other in removing the molded product from the cavity when the mold or die has been separated.

As previously set forth, the associated circumferentially aligned cores are in spaced relationship to each other, thus the cores collectively do not form a solid cylindrical body but rather a cylindrical body having four radial passages or cavities at adjacent edge portions of the respective elements and these passages will form between the inner tube 32 and the outer tube 40 four radial walls 48 which do not appear in Fig. 1, but are clearly indicated in the end view of the resulting spool in Fig. 1a. These walls integrally join all of the end wall structures of the resulting spool, and this structural arrangement will be clearly apparent from viewing a perspective view of a modified form of core unit, as seen in Fig. 2 of the drawing.

The particular assemblage and structure of the units 25 and 26 is of no special consequence. However, it will be apparent from a consideration of Fig. 1 that the respective elements are pinned to their core pins 27, 28 by key pins 49, 49' and supported within casings 50, 50' in which said elements are detachably mounted. The casings 50, 50' may be said to comprise core element holders in which different types and kinds of elements can be mounted.

In Figs. 2 to 5 inclusive I have illustrated in perspective four modified types of cores, it being apparent that the companion or associate part will be the same.

In Fig. 2, the core of Fig. 1 is modified to the extent of having three radially spaced circumferential core element groupings rather than four radially spaced groupings as shown in Fig. 1. This will modify the structure of the resulting molded spool in changing the end wall structure of the spool. The inner elements 51 would be generally similar to the elements 34. Outwardly of these are elements 52 generally similar to the elements 35, and outwardly of 52 will be elements 53 generally similar to the elements 37, 38. As a matter of fact, all of the elements 51, 53 will be of different radial dimensions than the elements shown in Fig. 1 so as to produce a spool having inner and outer tubes of the same

4

general size and dimensions as the spools shown in Figs. 1 and 1a but with fewer end wall members.

In Fig. 3 of the drawing, I have shown another form of core structure wherein each core unit has a plurality of circumferentially spaced radially tapered elements 54 with which will closely interfit in abutting relationship to each other elements of a companion unit so as to form a circumferentially continuous solid cylinder, and ends of the elements 54 will terminate short of the walls 55 of the unit to form at each end of the resulting spool radial ribs joining inner and outer tubes of the spool, each rib being of the same cross sectional area as the cross sectional area of each element 54. Means such as the interengagement of the pins 27 and 28 will be employed to check relative closing movement of the two elements in order to space the ends of the cores with respect to the walls 55.

In Fig. 4 of the drawing, I have shown another form of construction, one core unit being disclosed for producing spools having longitudinally spaced groups of circumferentially arranged spoke-like members intermediate the ends of the spool. In other words, instead of employing the radial longitudinal walls as seen at 48 in Fig. 1a, a plurality of spokelike members are provided and arranged in two groups that are spaced from each other, as well as from the ends of the resulting spool. At 56 and 57 in Fig. 4 of the drawing, I have indicated the positions defining the spacing of the spokes. In this construction, circumferentially spaced cores 58 are employed, the outer ends 59 of which are tapered in cross sectional form and terminate at their ends in slits 60 to form inwardly extending ribs on end walls formed on the resulting spool.

In other words, considering Fig. 3 of the drawing, here a multiplicity of tapered end wall members will be formed at each end of the spool, whereas with a core unit, such as shown in Fig. 4, six larger end walls will be formed, and these walls will have inwardly projecting reinforcing ribs formed by the slits 60. Adjacent the end 59 is a slightly larger or circumferentially thicker central portion 61 with the offset 56 therein forming one of the spoke stations. This offset will be equal to spacing between corresponding edges of end walls at opposed ends of the spool. This will be apparent from the groove or spacing 62 shown between adjacent elements 58 at the inner or wide end portions 63 thereof. In other words, the circumferential dimensions of each offset at 56 defines the circumferential dimension of each resulting spoke which is formed.

This is also true of the offsets at 57 which, in turn, would register with recesses similar to the recess 62 on the companion core unit which is not shown.

It will be clearly apparent from a consideration of Fig. 4 that the first offset 56 is at one side of each core element 58, whereas the offset 57 is at the opposed side thereof. Here again, when the companion core units are brought together, the ends of the elements including the offsets are spaced apart so as to form on the resulting molded spool the end walls including the spaced spoke arrangements. It will be apparent that the contour of the stations 56 and 57 can be modified to control the cross sectional area of each spoke which is formed.

In Fig. 5 of the drawing, I have shown at 64 one core unit or core for molding spools in which the end walls will have end wall portions arranged crosswise on the spool ends and integrally joining four longitudinal walls similar to the walls 48 of the spool shown in Fig. 1a. In other words, instead of employing the arc shaped or circumferential arrangement of end walls, such for example as the walls 44'-48' shown in Fig. 1a, a transverse arrangement of walls will be provided. In Fig. 5, two similar and spaced core elements 65 are shown which will define end wall portions adjacent the outer tube of the spool at each side of a longitudinal wall which would be formed by the recess 66 shown between the elements 65.

5

Adjacent the elements 65 are two elements 67 having curved inner surfaces as at 68 to partially form the outer surface of the inner tube of the spool, and ends of the elements 67 are slotted as seen at 69 to provide ribs on the end walls formed thereby, said walls having a contour similar to the cross sectional contour of the elements 67. Outer surfaces 70 are rounded to partially form the bore of the outer tube. This rounding also is on elements 65 as well as on the elements 71 and 72. The elements 72 are much like 67 except that they form end walls more closely adjacent the large diameter of the spool, it being apparent that the elements 67 are close to the small diameter of the spool.

Elements 72 are slotted as seen at 73 similar to the slot 69. Elements 71 are not slotted at their ends and are disposed closely adjacent the inner tube of the spool, and the flat surfaces 74 thereof form one side of the opposed longitudinal walls of the resulting spool, here again similar to the walls 48. It will be understood that the elements corresponding to the elements 71 will fit snugly on the surfaces of the elements 67, but will be spaced from the surfaces 74 to provide the clearance for molding of said horizontal wall. Recess 75 between the elements 72 in combination with the recess 66 of elements 65 form the other opposed longitudinal walls of the resulting spool when the companion core unit is associated with the unit shown in Fig. 5.

In Figs. 6 to 11 and 13, I have shown partial and full cross sections through interfitting cores utilized in forming molded spools of the type and kind under consideration; and in Fig. 12 I have shown diagrammatically in longitudinal section and part elevation, core units using elements of the type and kind shown in cross section in Fig. 8 of the drawing. In other words, aside from the cross sectional contour of the interfitting core elements employed, a core mounting generally of the type and kind illustrated in Fig. 12 is applicable to all of the structures shown in Figs. 6 to 11 inclusive.

In Fig. 6 of the drawing, I have shown what may be termed a mortise engagement of elements 76 having grooved sides as indicated at 77. At 78 I have shown the elements of the companion unit, the latter having projecting tongues 79 at opposed sides fitting in the grooves 77.

In Fig. 7, one of the core units comprising a series of elements 80 which might be said to be egg-shaped in cross sectional form interfitting with elements 81 having concaved recesses 82 on opposed sides thereof for reception of the elements 80.

In Fig. 8, elements on one core unit are indicated at 83, whereas elements of the companion core unit are indicated at 84. Here both core units are of the same cross sectional contour and interfit one with the other. In other words, these elements have interfitting rib and socket portions generally identified by the reference character 85.

In Fig. 9 of the drawing, I have shown at 86 elements of modified diamond cross sectional form interfitting with elements 87 of the companion unit, the latter having substantially V-shaped recesses 88 on opposed sides thereof.

In Fig. 10, I have shown what might be termed relatively inverted elements, the elements of one unit being shown at 89, and the elements of the other unit at 90, each element may be said to be of T and inverted T cross sectional form with the cross heads interfitting as generally identified by the reference character 91.

In Fig. 11 of the drawing, I have shown elements 92 of one unit which differ from the elements 93 of the opposed unit in providing narrow and broad tapered units which interfit one with the other.

In Fig. 13, the elements of one unit are shown at 94 and of the opposed unit at 95. These elements are generally of the contour shown in Fig. 8 with the exception that each element of the respective units are circumferentially wider than those shown in Fig. 8.

6

It will be understood that with all of the core structures shown in Figs. 6 to 11 and 13, the elements of one unit will form at one end of the spool end wall portions similar in plan to the cross sectional form of said elements, whereas corresponding walls at the other end of the spool will have the form of the cross sectional contour of the elements of the other companion unit.

In Fig. 13, the elements 94 and 95 have the same rib and groove engagement as with the structure shown in Fig. 8, the ribs of the elements 95 being shown at 96 and the ribs of the elements 94 are shown at 97. The grooves of the elements 94 are shown at 98 and grooves of the elements 95 are shown at 99.

In Fig. 12, 100 and 101 show two core units generally similar to the units 25, 26 but modified as to structure and mounting. At 102 is shown a spool molded on the elements 94 and 95, 103 representing the outer tube of the spool, and at 104 is shown the inner tube. At 105 is shown one pin forming the bore of the inner tube 104, and at 106 is the other pin, the pin 105 forming part of the unit 100, whereas the pin 106 forms part of the unit 101. Keyed to the unit 100 through a bushing key 107 are the circumferentially spaced core elements 94, one of which is shown at the upper portion of Fig. 12, and the rib 97 of this element is shown in elevation. A similar key bushing 107' is employed to key the circumferentially spaced elements 95 in position.

At the lower part of Fig. 12, one of the elements 95 is shown in elevation as is also the groove 99 thereof. The elements 94 terminate short of the unit 101 to form end walls 108 which integrally join the inner and outer tubes 104 and 103, as clearly shown at the right of Fig. 12, and each of these walls will be of the same contour as the cross sectional contour of the elements 94. At 109 is shown the corresponding walls formed at the ends of the elements 95, the walls 109 integrally joining the inner and outer tubes. Here again, the walls 109 will be of the same form as the cross sectional contour of the elements 95.

In Fig. 14 of the drawing, I have diagrammatically shown a sectional view through a core structure, including part of the die, the latter being applicable to the molding of any of the spools disclosed or utilizing any of the cores herein referred to. This particular core structure is suitable for use in the molding of what might be termed hard plastics, or plastics including additives where excessive pressures are employed establishing frictional engagements which could be so severe as to rupture the finished product in the operation of withdrawing the cores.

In Fig. 14, the sectional view illustrates the core structure in a partially opened position, that is to say, illustrating the operation of partially withdrawing the elements disposed between the inner and outer tubes of the spool prior to withdrawing the center parts forming the bore of the inner tube.

In Fig. 14, 110 and 111 represent two core units generally similar to the units 100 and 101 and modified to the extent that pins 112 and 113 are employed which operate in tubular parts 114 and 115, the latter forming the bore of the inner tube 116 of the spool, the other tube 117 being formed by the die or mold, part of which core elements 119 of the unit 110 and 120 of the unit 111. The parts 114 and 115 have large diameter bores 121 and 122 in which heads 123 and 124 at inner ends of the pins 112 and 113 operate. Normally when the parts are in closed operative position preparatory to pressure injection of the molded material into the dies or molds, the heads 123 and 124 are in abutting engagement centrally with respect to ends of the spool, and after the injection of the molded material into the dies or molds, the heads 123 and 124 in abutting engagement centrally with respect to ends of the spool, and after the injection of the molded material the units 110 and 111 are actuated to first partially withdraw the elements 119

and 120, while leaving the inner tube 116 supported on the parts 114 and 115. Thereafter, continued outward movement of the units 110 and 111 will operate to withdraw the parts 114 and 115 from the inner tube 116, and also to completely withdraw the elements 119 and 120 from the spool.

At 125 is shown a cross section of one of the end walls of the spool formed at the end of the element 119. In other words, a wall similar to the wall 108, and at 126 is a wall similar to the wall 109 formed at the end of the element 120. No specific contour has been attributed to the elements 119 and 120, and it will be apparent that they can be similar to any shown, for example in Figs. 6 to 11 and 13, and in fact similar to that shown in Fig. 3.

In Fig. 15 of the drawing, I have diagrammatically shown a sectional view through another form of core structure, generally of the type shown in Fig. 1, but modified to the extent of providing a simple core such as illustrated in Figs. 12 and 14 of the drawing, the illustration of Fig. 15 being included primarily to show the use of stripper plates 127 between the ends of the molded spool 128 and the enlarged casing portions of the core units 129 and 130, the unit 129 having elements 131 interfitting with elements 132 of the unit 130, and of predetermined cross sectional contour to define the formation of the end walls 133 and 134 similar to the walls 125 and 126. Units 129 and 130 include pins 135 and 136 similar to the pins 27 and 28 shown in Fig. 1 of the drawing.

Considering the operation of removing the pins as seen in Fig. 15, it will be apparent that the strippers 127 will support the ends of the spool 128 while the elements 131 and 132 are being withdrawn. These strippers are applicable to the structure shown in the other disclosures and it will be apparent that the stripper plates are apertured, as seen at 137, for passage of the elements therethrough.

The elements 131 and 132 are each of the same cross sectional form, and in Fig. 16 of the drawing I have shown a part of the nesting elements to indicate the ribs 138 on one side and the grooves 139 at the opposite side, the ribs of one fitting snugly in the grooves of the other, as clearly indicated in part in Fig. 16 of the drawing. Each wall 133 and 134 will have the same form as the cross sectional contour of each of the elements.

In Fig. 17 of the drawing, I have shown a simple form of core construction, one core unit 140 only being shown, this unit comprising a pin 141 on which is disposed a ring 142 with which a plurality of elements 143 are keyed as indicated at 144. At 145 a nut is employed which provides detachable mounting of different elements on different rings with respect to a single or common pin 141. Similar features are also listed in Figs. 12, 14 and 15.

In Fig. 17, the casing 146 of the core unit includes an extending flange portion 147 which forms on the outer surface of the spool 148 a recess 149 for reception of a label, thus keeping peripheral edges of the label within boundaries of the encircling rim 150. In Fig. 17 I have also illustrated an end wall structure 151 joining the inner and outer tubes 152 and 153 of the spool, the wall being tapered to be thicker at the inner tube than where it joins the outer tube. This construction provides added strength to the end wall structure of the spool and would be applicable to the showings in any of the other figures except where the ribbing is employed, it being understood that the ribs would accomplish the same reinforcing characteristics.

In Fig. 18 of the drawing, I have shown a broken section through another core construction, one core unit being indicated at 154 and part of the opposed unit at 155, these units having radially spaced elements as well as radially extending and circumferentially spaced elements to produce end wall combinations such as illustrated in part in Figs. 19 and 20 of the drawing. The

section Fig. 18 is taken through the broken line 18—18 of Fig. 19, the unit 154 having two elements 156 forming end wall portions 157 and 158 at one end of the spool 159 and arc shaped openings 160 and 161 at the other end of the spool, the latter openings being indicated in Fig. 19 of the drawing. A single element 162 of the unit 155 forms the arc shaped ribbed end wall 163 at the last named end of the spool.

It will be apparent from the right side of Fig. 18 that the outer element 156 is extended, as seen at 164, to have support in the unit 155, and this forms a recess 165 in the wall 157, note Fig. 19. The elements 156 and 158 represent one quarter section of the element unit, the other quarter section being cored to form on the end of the spool having the end wall 163 an inwardly extending end wall 166 on the outer tube 167 of the spool, and an outwardly extending end wall 168 on the inner tube 169 of the spool. These quarter sections are disposed side by side. It will also appear that pins 170 and 171 are employed and the pin 171 is shown in Fig. 18 to illustrate an extension 172 thereon to give support to the inner core element 156. This results in forming an arc shaped opening 173 in the end of the spool including the wall 158. The pin 170 is similarly formed, but this does not show in Fig. 18 of the drawing, but it will form an arc shaped aperture 173' similar to the aperture 173 in the wall 168.

The half section defined by the two quarter sections above referred to include longitudinal walls 174 between said quarter sections and similar walls 175 and 176 at the ends of said quarter walls, these longitudinal walls integrally joining the inner and outer tubes 169 and 167. The wall 175 has a longitudinal rib as at 177 extending into the other half section of the spool, whereas the wall 167 has a longitudinal groove 178.

The other half section of the spool has a plurality of radially extending end walls 179 and 180, one of the walls 179 being shown in Fig. 18, and a plurality of the walls 180 being indicated in part in Fig. 19. Both walls will be of the same contour, in other words, similar to the walls formed by the elements 131, 132 of Fig. 16, one of the elements for forming these walls, an element of the unit 155, being indicated at 181 in Fig. 18 of the drawing.

In Fig. 20 of the drawing, I have illustrated a partial end view of the modified form of spool made from a modified form of core, wherein two opposed quarter sections similar to the quarter section including the walls 166 and 168 are employed, these being designated by the reference characters 166' and 168', and at other opposed quarters of the spool will be arranged end walls 180' similar to the walls 180, and the elements of the core unit will be arranged to produce this end wall structure in the resulting spools.

As indicated, the present cores are useful with any generally suitable dies or molds, one of which was illustrated in Fig. 14. Usually these dies are in two parts or halves. In Figs. 21 and 22 another form of dies is illustrated which is employable with any of the cores or core units described herein. The showing in Figs. 21 and 22 is based on the structure of Fig. 14 except that in Figs. 21 and 22 the die 185 (only one die half is shown) is provided with projections 186 for producing apertures 187 in the thread-holding barrel 188 of the spool 189. Projections 186 are spaced circumferentially and longitudinally of the die; as shown in Fig. 22, these projections are adapted to form four longitudinal rows of apertures on one side of the spool barrel, and on the other side (not shown) of the barrel a similar arrangement of apertures is adapted to be formed. As shown in Fig. 22, the projections 186 are tapered towards their outer ends to enable them to be freed from the resulting apertures which are formed in the spool barrel.

Another modified core arrangement is shown in Figs. 23-25. The broken-off sectional view of the interfit-

ting core units of Fig. 23 may be better visualized by considering that the section is taken along the lines 23—23 of Fig. 24, the latter being an end view of a spool formed by the core units of Fig. 23. Core unit 190, shown in engagement with an identical core unit 191, comprises the casing 192 in which is disposed a core member 193, a perspective view of the latter being shown in Fig. 25. Core member 193 comprises a base part 194 having a pair of integrally formed, arcuate core elements 195 and 196 extending from one side thereof. The base element 194 is apertured as at 197. A core pin 198, around which the inner tube 199 of the thread spool is formed, extends through the aperture 197 and helps to support and position the core member 193 in the casing 192. Flanged nut 200 holds the core pin in place and serves as a means of moving the core unit relatively to the other core unit and to the dies. Casing 192 has an annular recess 201 on its outer side in which is disposed an annular ring piece 202 having circumferentially spaced projections 203 on its end edge; these projections serve to form the decorative, weight-reducing, material-saving openings 204 (note Fig. 24) in the peripheral portion of the end face of the spool. Ring 202 is push- or press-fitted on the casing. Integrally formed with the casing 192, and extending from the edge of the annular reduced section 205 are a pair of oppositely disposed, auxiliary elements, one of which is shown at 206. These elements serve to form the elongated arch-shaped apertures such as are shown at 207 and 208 in the near end face of the spool of Fig. 24. The auxiliary element 209 of the opposite core unit 191 is shown at the lower portion of Fig. 23, and as can be seen, it has an end extension 210 which serves to form the recess 211a (note Fig. 24) in the end wall portion 211 of the spool and also to support the auxiliary element 209 on the casing 192 by engaging or resting in a recessed portion 212 formed in the edge of the part 205. This particular construction is similar to that shown in the upper right-hand portion of Fig. 18. At its free or outer end the auxiliary element 209 helps to form the end wall portion 211.

Referring to Fig. 25, the core member 193, as noted, is formed with a pair of integral core elements 195 and 196. These elements have an identical but opposite construction, so that a description of one may suffice for both. Element 196 has stepped side edges, one of which, indicated at 213, may be seen to comprise a projecting portion 214 and a recessed portion 215. When the corresponding side edge of a core element of the opposite core unit engages the edge 214, the projecting portions of the engaging edges abut each other and a groove is formed comprising the recessed portion 215 and the corresponding recessed portion of the engaging element, and in this groove there is formed a longitudinally extending rib in the spool which extends from end to end thereof and which is integrally joined to the barrel 216 of the spool. Four such ribs are formed, the terminal end edges of which are shown in Fig. 24 at 217, 218, 219 and 220. As is apparent, these ribs do not engage the inner tube 199 of the spool, this construction serving to lighten the weight of the spool and to economize material without unnecessarily reducing the spool strength. The outer end edge of core element 196 has an arcuate shaped projection 221 which forms a cut-out 222 in wall portion 223 of the spool, the cut-out 222 and portion 223 being in the far end of the spool of Fig. 24; the corresponding structures in the near end of the spool are indicated as 222a and 223a, and are formed by the core element 196a and its projection 221a of the opposite core unit 191. Adjacent the projection 221, the core element is stepped, as at 224, in order to form an inwardly extending short rib, such as the rib 225 on the end wall portion 223a. Recess 226 on the inner side of core element 196 engages an extension 227 on core pin

198, thus enabling the core element to be supported at its outer end in much the same way as core element 156 (Fig. 18) is supported on the extension 172 of core pin 171.

Another modification is shown in Figs. 26–28 which is characterized by the fact that the core elements, instead of having a cross section of completely arcuate shape, as in Figs. 23–25 for example, have one side surface of arcuate shape. Also, the thread spool produced by the core arrangement of Figs. 26–28 does not have any longitudinal ribs extending from one end wall to the other. A light weight spool is thus produced. As shown, the core unit 230 is in engagement with an opposite and identical core unit 231. The unit 230 comprises the casing 232 having core member 233 disposed therein, a perspective view of the latter being shown in Fig. 28. Core member 233 comprises the base part 234 having a pair of integrally formed core elements 235 and 236 extending therefrom; the member 233 is held in place in the casing by means of the core pin 238 which extends through the aperture 237 of the core member and is engaged by the nut 240. Abutting the free annular edge 241 of casing 232 is an annular ring piece 242 having circumferentially spaced projections 243 on its free edge, these projections serving to form the openings 244 in the spool (note Fig. 27) as in the case of the openings 204 in Fig. 24. Core member 233 is provided with a pair of removable auxiliary elements, one of which is shown at 245, and these elements are each adapted to fit in a slot, one of which is shown at 246, in the base part 234 of the core member. Auxiliary element 245 has a bottom extension 247 which engages a corresponding cut-out 248 in the lower part of the base part 234. Auxiliary element 249 of the opposite core unit 231 is partially shown in Fig. 26. The auxiliary elements, at the inner or casing end of each core unit, form the openings 250 and 251 in the end face of the spool, while at the outer or free ends of these elements there is formed the end wall portions 252 and 253.

Although oppositely placed, the structure of the core elements 235 and 236 is identical; a description of only one will be given. As is apparent, core element 236 has an inner side surface or face 254 of arcuate or concavely curved shape, while its outer face, indicated as 255, is flat. This is in contrast to auxiliary element 245 which has a flat inner face and an arcuate or convexly curved outer face. The side 254 of element 236 joins the side edge 256 through a bevelled side 257; the same construction prevails at the opposite side edge. A step 258 is formed at the outer or free end of element 236 on the flat side thereof. This stepped arrangement forms the inwardly extending ribs, such as those shown at 259 and 260, in the end wall portions 261 and 262 of the spool. The stepped arrangement is illustrated in Fig. 26 at 263 on the core element 264 of the core unit 231, there being formed the rib 260 on the end wall portion 262. The inner end portions of the core elements form the openings 265 and 266 in the end wall of the spool.

In Figs. 29 and 30 another modification is shown according to which each of the core elements of one core unit is supported on the opposite core unit. As shown in Fig. 29, two interfitting core units are illustrated, some details of the units being omitted in order to reveal the essential parts of the modification. The core units, which are identified as 270 and 271, are identical and comprise a base part 272 and 273, respectively, each of which is provided with three interfitting core elements of which two are shown at 274 and 275. Centrally of the core elements are the abutting core pins 276 and 277. As may be understood, a greater number of core elements may be employed in each core unit. An idea of the cross-sectional form of the core element 275 is provided by the end wall space 278 (Fig. 30) which is formed by the inner end portion of the core element. A longitudinally tapered groove 279 is formed in the underside of the core element

275, the groove terminating adjacent the right-hand end of the element and serving to form a rib 280 on the inner tube 281 of the spool. Opposite groove 279 the core element has another longitudinally extending tapered groove 282 which terminates adjacent the right-hand portion of of the core element and which forms the reinforcing rib 283 on the barrel of the spool. Ribs such as 280 and 283 may be formed by each of the core elements of each core unit. The outer or free end of core element 275 terminates in a reduced portion 284 inwardly of which is a circular shoulder 285. The reduced portion 284 is supported in a recess 286 in the base part 272 of the opposite core unit 270. As may be apparent, the reduced portion 284 forms an opening 287 in the end wall portion 288 of the spool, the portion 288 being formed between the shoulder 285 and the base part 272.

Inwardly of the reduced end portion of each core element is a stepped portion, comprising (note core element 274) a shoulder 291 and, towards the free or outer end of the core element, a recessed part 292; the latter helps to form on the spool a rib, such as is illustrated at 293 in Fig. 30, which extends inwardly of the end face of the spool a short distance and which is attached to one side of the end wall portion 294. Each such end wall portion has a rib at each side of the same, note end wall portion 295 having ribs 296 and 297.

Referring briefly to Fig. 30, it will be apparent that each end wall or end face has three end wall portions (two of which are shown at 294 and 295) integrally formed with the inner tube and the outer barrel of the spool, and alternating with these end wall portions are end wall spaces (two of which are shown at 178 and 298). Ticket labels may be adhered to either end of the spool, being supported on the end wall portions and also on the end edges or surfaces of the inner tube and of the outer barrel. It may be noted that end wall portion of one end face of the spool is aligned with an end wall space in the opposite end face.

In Fig. 31 a further modification of a core unit is shown and comprises a base part 300 having core elements 301—306 extending from one side. The elements may be integrally formed with the base part or may be supported thereon in any suitable way. The base part is apertured at 307 for reception of a core pin. Each core element is twisted, so to speak, longitudinally thereof, so that the elements as a group have a helical curvature or appearance. The amount of twist is such that the free end 308 of element 302 is in axial alignment with the space 309 on the same base part 300, which space separates the inner end portions 310 and 311 of the adjacent core elements 302 and 303. The opposite core unit is similar to that shown in Fig. 31. When a pair of these units are employed to form a thread spool, they are interlocked or interengaged by rotating them during the operation of moving them towards each other. They are rotated in the opposite direction to disengage them. In the end walls or end faces of the spool produced by these core units, the end wall portions of one face will not be in alignment with the end wall spaces of the opposite face, as for example in Fig. 30, but instead the end wall portions of one face will be aligned with end wall portions of the opposite face, and the same is true of the end wall spaces. The outer or free end of each core element is provided with a groove, such as that shown at 312, for producing on each end wall portion of an end face an inwardly extending reinforcing rib. If desired, the free end of each core element may be stepped, as in the case of the core elements of Fig. 29, to produce a pair of ribs, one on each side of an end wall portion.

In the use of the several cores disclosed for forming spool bodies, it will appear that end wall portions are formed at the opposed ends of the resulting spool, which end wall portions provide relatively large surface areas distributed over the ends in such manner as to provide supports for conventional labels mounted on the spool

ends. In some instances, the end wall portions are reinforced by ribs and further join longitudinal wall portions that extend radially with respect to the axis of the spool. In other instances, I supplement the longitudinal walls with series of radially extending members that are circumferentially spaced which form on the resulting spool spokelike reinforcements between the inner and outer tubes of the spool. Again in some instances, the resulting end wall portions are all circumferentially arranged, or a combination of circumferentially arranged and radially arranged end wall portions, are employed, as for example in Figs. 19 and 20. In other instances, all of the end wall portions are radially arranged, as for example spools produced from cores such as shown in Figs. 3, 4, 6 to 11, 13 and 16 of the drawing. In addition to the foregoing, end wall portions extending transversely across the ends of the spools can be employed for joining the inner and outer tubes as well as radial longitudinal walls, and such spools are produced from cores of the type and kind illustrated in Fig. 5 of the drawing.

In all instances, the two cores of each pair of cores employed have interfitting core members or elements which collectively form the recesses or cavities within the spool body between the inner and outer tubes thereof. Interfitting of the cores one with respect to the other is clearly illustrated in Figs. 6 to 11, 13 and 16, but this interfitting will also be apparent with respect to the description of the cores shown in Figs. 2 to 5 inclusive. The core elements are pulled through opposed ends of the molded spool body and define the shape and contour of the openings formed in the opposed ends of the spool and between the end wall portions of the spool. In this connection, it will be understood that the opening is shaped to conform with the largest diameter cross-sectional area of each core element, here reference being specifically had to the structure as shown in Fig. 4 of the drawing.

For purposes of description, the enlarged supporting end of each core unit may be termed the core body, and projecting therefrom are core elements, and in all instances the core elements terminate at their free ends short of or in spaced relation to the core body of the companion core unit, and by this arrangement and spacing the end wall portions on the resulting molded spool are formed. In all cases, the units include center pin parts which can be generally referred to as core pins which interfit and form the bore of the inner tube of the spool.

Although the core elements of Figs. 29 and 30 actually rest in the base part or core body of the opposite core unit, these elements, or rather the free or outer ends of the same, may still be considered as having portions thereof spaced from the core body of the opposite unit in that the shoulder, such as 285, of each element, such as 275, is spaced from the opposite core body, such as 270, sufficiently to enable an end wall portion of the end face of the spool to be formed.

With cores of the type and kind disclosed in Fig. 5 of the drawing, descriptively speaking, the core elements may be said to be tangentially arranged on the body, or for the most part may be said to comprise core elements having opposed flat parallel surfaces, it being apparent that part of the core elements will be rounded, as for example the elements 65, but in this sense the elements of Fig. 5 distinguish from the other elements disclosed wherein the surfaces are either divergent or of some other contour, except with the element as shown in Fig. 2 wherein the opposed surfaces are parallel but are shaped in form.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A core assemblage for producing a molded spool comprising an inner tube, an outer tube, and end wall portions joining said tubes, said assemblage comprising a pair of interfitting core units, each unit comprising a body having a plurality of outwardly projecting and circum-

ferentially spaced core elements, the core elements of one unit interfitting with the core elements of the associate unit, ends of the elements of each unit of the assembled units being spaced from the body of the opposed unit to form end chambers in which said end wall portions of the spool are formed, aligned means centrally of each core unit and spaced radially inwardly with respect to said elements for forming in combination with the elements of both units an inner chamber in which said inner tube is formed, said inner chamber being in communication with at least part of said end chambers so that said inner tube is integral with at least part of said end wall portions, and said units being operable in a mold and forming an outer chamber therewith outwardly of said elements in which the outer tube of the spool is formed, said outer chamber being in communication with at least part of said inner end chambers so that said outer tube is integral with at least part of said end wall portions.

2. A core assembly for forming a die cast plastic thread spool having an inner tube, outer barrel, and end walls joining the tube and barrel, said assembly comprising a pair of core units movable toward and from a die cavity in which said spool is formed, said unit being adapted to form the inner tube and the end walls of the spool; each core unit comprising a circular base part, a cylindrically shaped central pin part extending from the base part, and a plurality of detachable longitudinal core elements extending from the base part and circumferentially spaced around the pin part; said core units being interengageable so that the pin part of one unit abuts and engages the pin part of the other unit within the inner tube of said spool, the base part of each interengaged core unit serving to define the outer end face of an end wall of the spool, each core element of one of said interengaged core units interfitting and making contact with at least one core element of the other unit, said interfitting core elements being disposable between the inner tube and the outer barrel of the spool, and at least a portion of the end of each core element of each unit being spaced from the base part of the opposite unit to enable said end walls of the spool to be formed therebetween.

3. A core assembly according to claim 2 in which each core element of one core unit has a grooved lateral side and an opposite ribbed side engageable, respectively, by a ribbed side and a grooved side of a pair of adjacent core elements of the opposite core unit.

4. A core assembly according to claim 2 in which the ends of each core element are recessed to form ribs on said spool integral with the end walls thereof.

5. A core assembly according to claim 2 in which said interfitting core elements of the interengaged core units have a plurality of recesses spaced circumferentially thereof for forming radial rib portions intermediate the ends of the spools and connecting said inner tube and outer barrel.

6. A core assembly for forming a die cast plastic thread spool having an inner tube, outer barrel, and end walls joining the tube and barrel, said assembly comprising a pair of core units movable toward and from a die cavity in which said spool is formed, said units being adapted to form the inner tube and the end walls of the spool; each core unit comprising a circular base part, a cylindrically shaped central pin part extending from the base part, a plurality of detachable longitudinal core elements extending from the base part and circumferentially spaced around the pin part, and a plate member on the inner end of the base part having apertures for receiving said core elements and pin part; said core units being interengageable so that the pin part of one unit abuts and engages the pin part of the other unit within the inner tube of said spool, each core element of one of said interengaged core units interfitting and making contact with at least one core element of the other unit, said interfitting core elements being disposable between the inner tube and the outer barrel of the spool, at least a portion of the end of each core element of each unit being spaced

from the plate member of the opposite unit to enable said end walls of the spool to be formed therebetween, and the plate member of each interengaged core unit serving to define the outer end face of an end wall of the spool and to support said spool during movement of said core units away from the formed spool.

7. A core assembly for forming a molded product comprising a pair of core units movable toward and from a die cavity in which said product is formed, each core unit comprising a circular base part, a cylindrically shaped central pin part extending from the base part, and a plurality of longitudinal core elements extending from the base part and circumferentially spaced around the pin part, said core units being interengageable so that the pin part of one unit abuts and engages the pin part of the other unit, the base part of each interengaged core unit serving to define an end face of said product, each core element of one of said interengaged core units interfitting and making contact with at least one core element of the other unit, and at least a portion of the end of each core element of each unit being spaced from the base part of the opposite unit to enable portions of said product to be formed therebetween.

8. A die core and structure for forming a plastic thread spool having an inner tube, an outer barrel, and end walls joining the tube and barrel, said structure comprising a pair of relatively movable dies having mating cavities which define the outer sides of the spool barrel; a pair of core units movable toward and from the ends of the cavity in which said spool is formed and defining the inner tube and the end walls thereof, each core unit comprising a circular base part, a cylindrically shaped central pin part extending from the base part, and a plurality of longitudinal core elements extending from the base part and circumferentially spaced around the pin part, said core units being interengageable so that the pin part of one unit abuts and engages the pin part of the other unit within the inner tube of said spool, said abutting pin parts being spaced from the core elements in order to form the inner tube therebetween, the base part of each interengaged core unit serving to define an outer end face of an end wall of the spool, each core element of one of said interengaged core units interfitting and making contact with at least one core element of the other unit, said interfitting core elements being disposable between the inner tube and outer barrel of the spool, at least a portion of the end of each core element of each unit being spaced from the base part of the opposite unit to enable said end walls of the spool to be formed therebetween, and said interfitting core elements being spaced from surfaces of the die cavities to permit said outer barrel to be formed.

9. A core assembly according to claim 2 in which each core element has an inner side of narrower width than the opposite outer side, said inner side being defined as the side disposed towards the inner tube of said spool.

10. A core assembly according to claim 9 in which each core element has a cross section which is tapered from the outer to the inner sides thereof.

11. A core assembly according to claim 2 in which at least one core element of one core unit has an extension on the end thereof which engages the base part of the opposite core unit and serves to form an opening in the spool end wall formed adjacent said base part of said opposite core unit.

12. A core assembly according to claim 2 in which the base part of a core unit has at least one projection extending from the outer edge thereof for forming a recess in the end face of the spool adjacent the outer periphery of said end face.

13. A core assembly according to claim 2 in which each core unit has means for supporting a cast spool during the separation of the interengaged core units and their withdrawal from the spool.

14. A core assembly according to claim 12 in which

15

each said base part has a plurality of circumferentially spaced projections extending from said outer edge for forming weight-reducing plastic-saving openings in said end face of the spool adjacent the outer periphery thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

16,166 Smith ----- Dec. 2, 1856

5

481,952
622,746
806,783
2,107,018
2,266,887
2,541,923

16

Ingram ----- Sept. 6, 1892
Wolcott ----- Apr. 11, 1899
Dayton ----- Dec. 12, 1905
Wendes ----- Feb. 1, 1938
McCoy ----- Dec. 23, 1941
Huxham ----- Feb. 23, 1951

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,890,490

June 16, 1959

Louis H. Morin

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 10, for "95" read -- 94 --; line 62, after "of which" insert -- is indicated at 118, and the circumferentially spaced --; lines 71 to 74, strike out "into the dies or molds, the heads 123 and 124 in abutting engagement centrally with respect to ends of the spool, and after the injection of the molded material --; column 11, line 32, for "178" read -- 278 --; column 13, line 17, after "said" strike out "inner".

Signed and sealed this 13th day of October 1959.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents