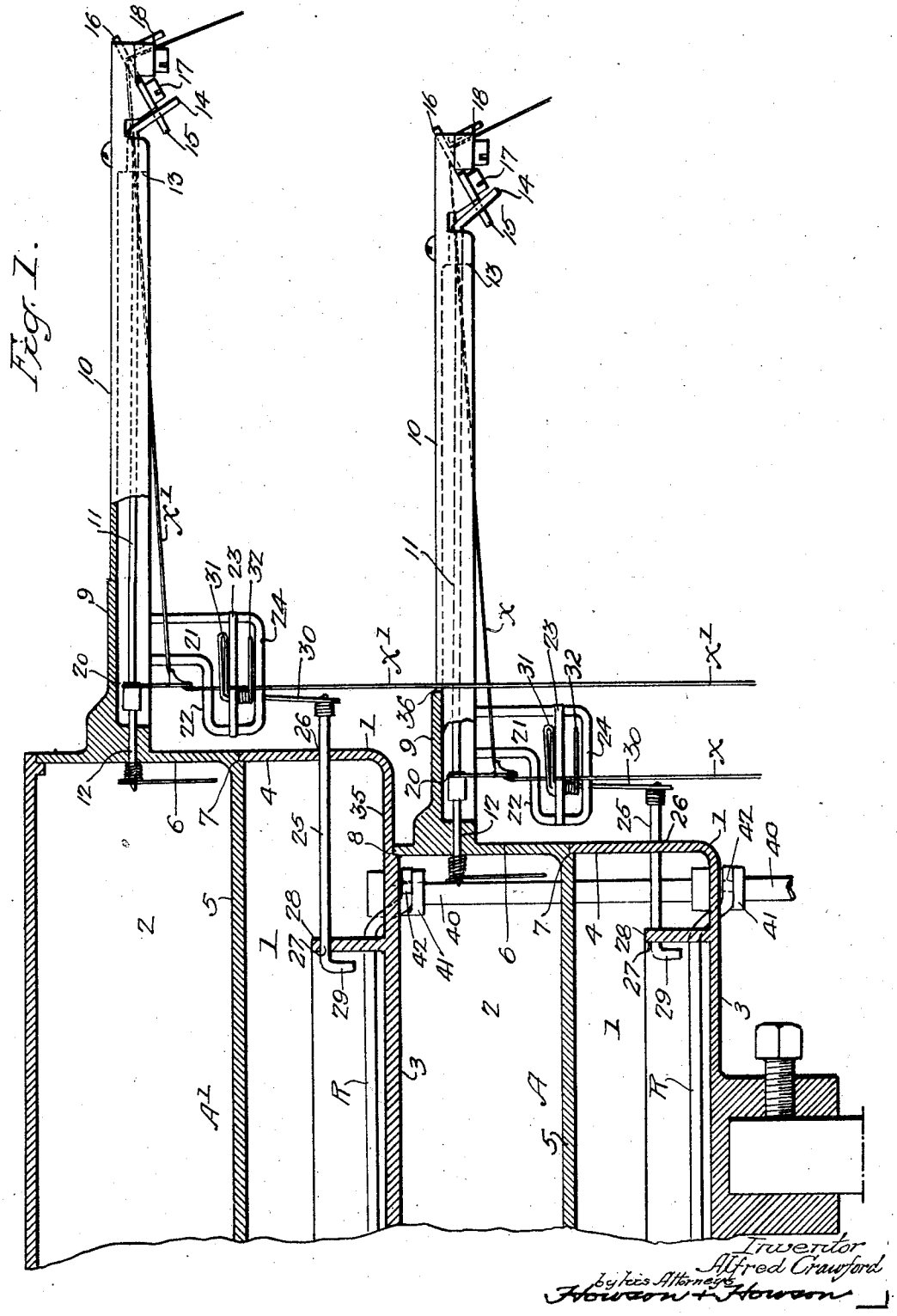
April 19, 1932. A. CRAWFORD 1,855,099

STOP MOTION FOR KNITTING MACHINES

Filed April 9, 1930 2 Sheets-Sheet 1

Fig. 1.



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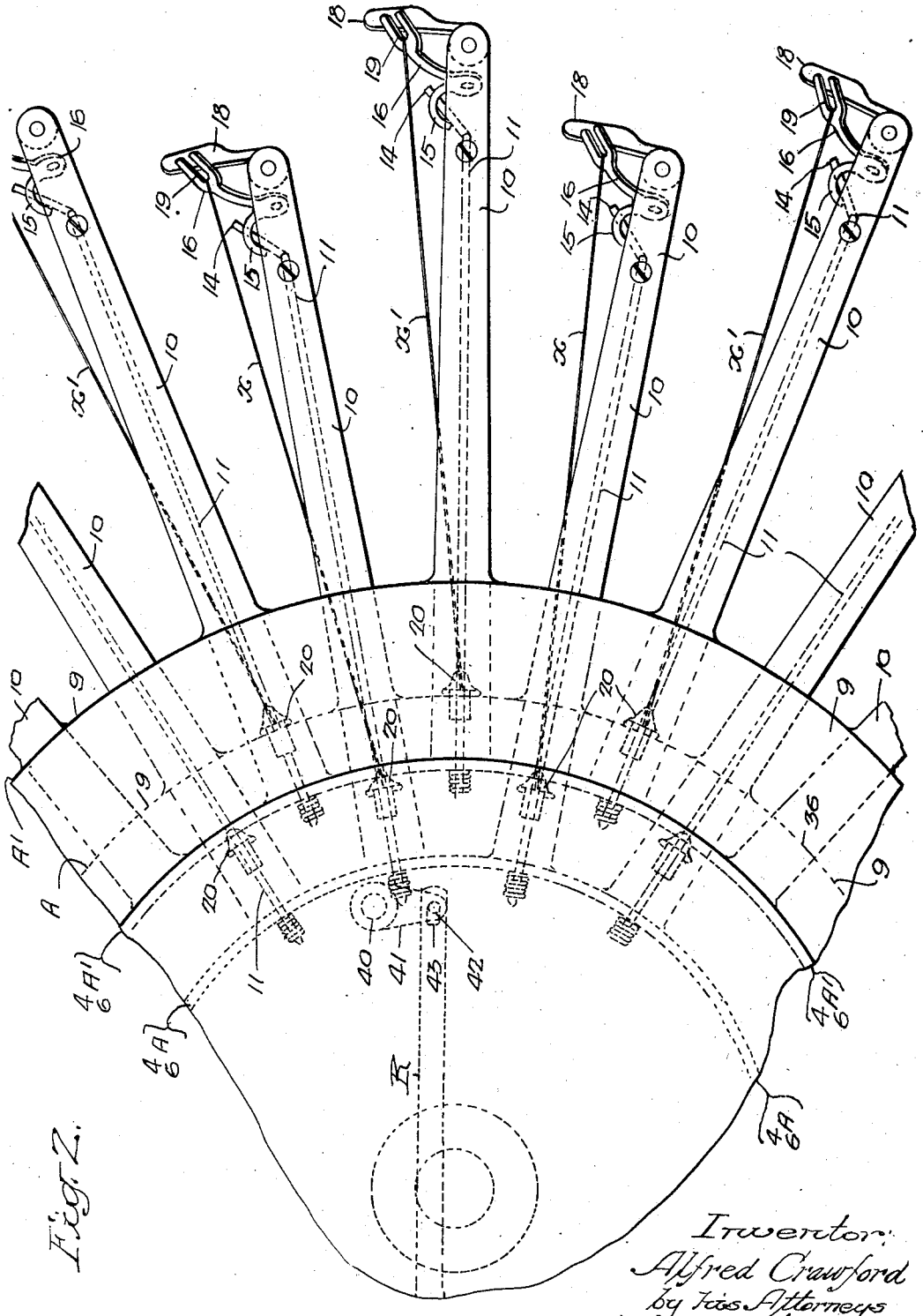

Fig. 2.

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UNITED STATES PATENT OFFICE

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STOP MOTION FOR KNITTING MACHINES

Application filed April 9, 1930. Serial No. 442,901.

This invention relates to a knitting machine stop motion of the same general character as that shown and described in a prior U. S. patent to Frank Crawford No. 510,829, dated December 12, 1893.

The device disclosed in the above mentioned patent was designed for use with knitting machines running eight knitting threads at one time, the stop motion being common to all the knitting threads and adapted to be actuated by one or more of the threads, to stop the knitting machine, if certain abnormal conditions arose in any one of the threads, or in two or more of the threads simultaneously. Obviously, this general type of stop motion is capable of handling more or less than eight ends with equal effectiveness.

Recent developments in the knitting art require the handling of extremely large numbers of threads, for example from 30 to 60 ends. Structural limitations such as necessary operating clearances, increased inertia of enlarged and multiplied parts, etc., and the fouling of closely positioned threads have made the use of a single stop motion, common to all such threads, practically impossible, in the machines employing such a large number of threads.

As shown in the said prior patent each of the threads controls an individual trip-rod and the entire number of trip-rods control, and also are controlled by, an actuating disc which is common to all the trip-rods. To provide a common actuating disc for the large number of trip-rods necessary to control the large number of individual threads, above noted, would necessitate the making of the actuating disc of a relatively large size and heavy construction, which would increase the inertia of this essential element to such an extent that the sensitiveness of the device would be materially affected, making the actuation of the disc sluggish, and practically impossible by any single one of the trip-rods, should an abnormal condition arise in the thread controlling such trip-rod.

As shown in the said prior patent, the stop motion comprises a substantially circular casing from which radially extends a plurality of arms, one for the support of each of the threads to be controlled. Each of the radially extending thread-supporting arms is provided with an inner thread guide located adjacent the wall of the casing and carried by a rock shaft which extends inwardly toward the center of the casing. On the outer end of each thread-suporting arm is a pivotally mounted thread guide which co-operates with an arm on the rock shaft to rock said shaft and release the thread from the inner thread guide thereon when abnormal tension is applied to the thread.

Below each of the inner thread guides is a slack detector through which the thread runs. The slack detector is operatively associated with the trip-rods, above noted, and functions to actuate the trip-rod if abnormal slack occurs in the thread, or if the thread breaks.

Obviously, the diameter of the casing limits the number of arms which may extend therefrom and to increase the diameter of the casing to accommodate more arms would necessarily require the increasing of the diameter of the actuating disc within the casing to take care of the consequent increased number of trip-rods. This, as above noted, would necessitate the making of the disc of a relatively heavy construction which would affect the operation of the device in the manner above noted.

In order to provide a compact stop motion capable of handling an extremely large number of threads as required by present day conditions, I have developed a multiple or double-deck stop motion, comprising two independent, axially aligned and superimposed stop motion units, each of which embodies the essential elements shown and described in the said prior patent to Frank Crawford.

In order to prevent tangling of the various series of threads controlled by the respective stop motion units I have increased the diameter of the casing of the upper stop motion unit so that the casing of the said upper unit overhangs that of the lower unit, thereby producing in the aggregate a unitary stop motion casing of stepped formation, and I have arranged the radially extending arms of the

larger upper unit casing in such a manner that they lie respectively above the spaces between the radially extending arms of the smaller casing of the lower unit, all as will be fully disclosed hereinafter, reference being had to the accompanying drawings, of which:

Fig. 1 is a sectional elevation of sufficient of the stop motion as to illustrate my invention, and

Fig. 2 is a fragmentary plan view illustrating the relation between the arms of the upper and lower units respectively.

Each of the superimposed stop motion units A and A^1 comprises a lower casing 1, and an upper casing 2. The lower casing 1 comprises a bottom plate 3 and a vertically extending peripheral flange 4, providing a housing for the operating parts of an independent stop motion mechanism, not shown in the present application, but which as above noted, is substantially the same as that shown in the said prior patent to Frank Crawford.

The upper casing 2 of each stop motion unit, comprises a bottom plate 5 and a vertically extending peripheral flange 6. The bottom plate 5 of the upper casing 2, in each instance, is provided with an annular shoulder 7 adapted to receive the upper edge of the peripheral flange 4 of the lower casing 1 of the corresponding unit, to maintain axial alignment between the upper and lower casings of each stop motion unit.

In order to maintain axial alignment between the double casing 1—2 of the lower unit A and the double casing 1—2 of the upper unit A^1, the bottom plate 3 of the lower casing 1 of the upper unit A^1 is provided with an annular shoulder 8, adapted to receive the peripheral flange 6 of the upper casing 2 of the lower unit A.

The vertical flange or wall 6 of the upper casing 2 of each unit is provided with a horizontally extending flange 9, to each of which, in the present instance, is secured or formed integral with, a series of radially extending thread-supporting arms 10, 10.

On each of the arms 10 is pivotally mounted a rock-shaft 11, the inner end of which extends into the upper casing 2 of the stop motion unit and therein co-operates with tension regulating mechanism, not shown in the present application but which is similar in character to that shown in the said prior U. S. patent.

The inner end of the rock-shaft 11 is mounted in a bearing 12 formed in the vertical wall 6 of the casing 2. The outer end of the rock-shaft 11 is mounted in a bearing 13 secured to the outer end of the arm 10. Adjacent the bearing 13, the rock-shaft 11 is provided with an arm 14 which is adapted to be engaged by one arm 15 of an outer thread guide 16. The outer thread guide 16 is pivotally mounted at 17 to the outer end of the arm 10, a guard 18 being provided on the end of the arm for maintaining the thread within the throat 19 of the pivoted thread guide 16.

Adjacent the bearing 12, or the vertical wall 6 of the upper casing 2, each rock-shaft 11 is provided with an inner thread guide 20.

Depending from each of the arms 10 is a grid-like structure 21 having horizontally extending bars 22, 23 and 24.

Pivotally mounted in and extending radially from each of the lower casings 1 of the units A and A^1 respectively is a series of horizontally disposed trip-rods 25, there being one trip-rod for each of the radially extending arms 10. Each trip-rod 25 is rotatably mounted in a bearing 26 formed in the vertical wall 4 of the lower casing 1 of each unit and adjacent its inner end the trip-rod is mounted in a bearing 27 formed in a vertically extending lug or rib 28 which projects upwardly from and, in the present instance, is formed integral with the base plate of the lower casing 1.

Inside the circular rib 28, each of the trip rods 25 is provided with an arm 29. The arm 29 is adapted to cooperate with the actuating disc of the stop motion unit, which is not shown in the present application but which corresponds substantially with that shown in the said prior U. S. patent.

On the outer end of each of the trip-rods 25 is secured a drop wire 30 having laterally extending arms 31 and 32 adapted to lie respectively in the spaces formed between the horizontal bars 22, 23 and 24 of the grid structure 21 with which the particular drop wire is associated.

The threads controlling the stop motion pass respectively from the spools or cones, not shown, but which are adapted to be located substantially in vertical alignment with the outer thread guides 16 of the arms 10, the said threads passing through the throats 19 of the outer thread guides 16, then substantially parallel to the arms 10 and over the hook-like inner thread guides 20, then downwardly to one side of the bars 22, 23 and 24 of the grid structures 21 to the thread guides which are adapted to feed that particular thread to the needles of the knitting machine with which the stop motion is associated.

The threads in passing downwarly from the inner thread guides 20 of the rock-shafts 11 pass between the bars of the grid structures 21 and the laterally extending arms 31 and 32 of the drop wires 30, in each instance, and thereby maintains the trip-rods 25 respectively associated with the drop-wires 30 in normal ineffective positions.

The construction and operation thus far described is substantially the same as that of the aforesaid prior patent, insofar as each of the individual and independent stop motion units is concerned.

In order to provide for a maximum number of threads to be handled by each unit of the stop motion, the arms 10 of each unit are spaced merely a sufficient distance apart to provide working clearance for the individual elements associated with each arm within the casings of the stop motion units, and immediately adjacent the outside thereof.

In order to increase the number of threads capable of being handled by the stop motion as a whole or unitary device, I provide two or more separate units arranged in superposed axially aligned relation to each other and in such a manner with respect to each other that the arms 10 of the upper unit are disposed above the spaces formed between the arms 10 of the lower unit. Thus, the threads x^1 supported by the arms of the upper unit are substantially equidistantly and angularly spaced from the threads x which are supported by the arms of the lower unit, each thread thereby being assigned a definite vertical plane of operation.

In order to avoid tangling of the threads x^1 of the upper unit with the threads x of the lower unit at the points immediately adjacent the stop motion casing, where the said relative spacing of the threads is naturally closer than at the outer ends of the arms 10, the outer walls 4 and 6 of the casings 1 and 2 of the upper unit A^1 are of a relatively larger diameter than the corresponding walls of the lower unit A, thus providing an overhang or step, such as indicated at 35 in the unitary stop motion casing formed by the casings of the units A and A^1.

In this manner the inner thread guides 20 and the grid structures 21 of the upper unit A^1 are disposed a greater distance from the axis of the stop motion than are the corresponding thread guides 20 and grid structures 21 of the lower unit A. Thus the down runs of the threads x and x^1, in addition to their angular circumferential spacing around the periphery of the stop motion casing, are also radially spaced with respect to each other, providing a maximum amount of clearance for each thread to avoid its becoming entangled with adjacent threads, this radial spacing of the threads x^1 from the threads x being further accentuated by the threads x^1 engaging the peripheral edge 36 of the horizontal flange 9 of the lower unit A.

The vertical spacing of the thread guides 16 and 20 of the superposed units A and A^1 respectively provides vertical spacing of the horizontal runs of the threads x, x^1.

From the above, it will be observed that by employing the mechanism shown and described in the above-mentioned U. S. patent and by superimposing two or more of these units one above another and by so arranging the units with respect to each other in such a manner that the supporting arms of one unit lie above the spaces between the supporting arms of the other unit, I may accommodate an extremely large number of threads without affecting the sensitiveness of the device, which is characteristic of the device shown in the said prior U. S. patent, and by merely increasing the outer diameter of the casing of the upper unit I provide sufficient clearance for the threads on their down run to the knitting machine to prevent the threads from becoming entangled one with another.

Each of the stop motion units is provided with a slide R of the same character as shown in the said U. S. patent which is actuated through the medium of the actuating disc to move radially inward when one of the trip-rods 25 is actuated to effect the stopping of the knitting machine to which the stop motion is connected.

In the present instance, a common machine control element is provided in the form of a vertically disposed shaft 40, for stopping the machine when either of the stop motions is actuated. This control element 40 is provided with an arm 41 adjacent the bottom of each of the respective units A and A^1, each arm 41 being provided with a vertically extending pin 42 which projects into an elongated slot 43 formed in the respective operating slide R.

Upon referring to Fig. 2, it will be obvious that when one of the slides R is moved radially inward by reason of the actuation of the stop motion with which that particular operating slide is associated, the pin 42 of the actuated slide R by reason of its lying in engagement with the outer end of the slot 43 in said slide will cause the shaft 40 to be rocked about its axis, through the medium of the arm 41, and the pin 42 of the unaffected unit will be free to move within the elongated slot 43 of the slide R of said unaffected unit, thereby causing no operation whatsoever of the said unaffected unit.

The lower end of the shaft 40 may be connected in any suitable manner, within the skill of an ordinary mechanic so that rocking of the shaft 40 about its vertical axis in the manner noted will effect the stopping of the knitting machine to which the apparatus is applied.

I claim:

1. A stop motion comprising a series of radially extending thread-supporting arms, a second series of radially extending arms vertically and relatively closely spaced and with respect to the first said series with the centers from which the arms of the respective series radiate being in axial alignment, the arms of the one series being positioned over the spaces between the arms of the other series, providing angular spacing between the alternating arms of the two series for respectively supporting different individual threads in close order.

2. A stop motion comprising a series of radially extending thread-supporting arms, a second series of radially extending arms vertically and relatively closely spaced and with respect to the first said series, the arms of the one series with the centers from which the arms of the respective series radiate being in axial alignment being positioned over the spaces between the arms of the other series, providing angular spacing between the alternating arms of the two series, a thread guide at the outer end of each arm, and a thread guide at the inner end of each arm, the inner thread guides of the one series of arms being spaced radially with respect to the inner thread guides of the other series of arms for respectively supporting different individual threads in close order.

3. A stop motion comprising a casing, a series of thread-supporting arms extending radially from said casing, and a second series of thread-supporting arms extending radially from said casing in relatively close vertical and angular spaced relation to the arms of the first said series.

4. A stop motion comprising a casing, a series of thread-supporting arms extending radially from said casing, a second series of thread-supporting arms extending radially from said casing in relatively close vertical and angular spaced relation to the arms of the first said series, a stop motion mechanism controlled by the threads supported by the first said series of arms, and an independent stop motion mechanism controlled by the threads supported by the second said series of arms.

5. A stop motion comprising a casing, a series of thread-supporting arms extending radially from said casing, a second series of thread-supporting arms extending radially from said casing in relatively close vertical and angular spaced relation to the arms of the first said series, a stop motion mechanism controlled by the threads supported by the first said series of arms, an independent stop motion mechanism controlled by the threads supported by the second said series of arms, and a machine-controlling element common to both said stop motion mechanisms.

6. A stop motion comprising a casing, a series of thread-supporting arms extending radially from said casing, a second series of thread-supporting arms extending radially from said casing in relatively close vertical and angular spaced relation to the arms of the first said series, a stop motion mechanism controlled by the threads supported by the first said series of arms, an independent stop motion mechanism controlled by the threads supported by the second said series of arms, a machine-controlling element common to both said stop motion mechanisms, and means connecting each stop motion mechanism to said controlling element for actuation thereof independent of the other said stop motion mechanism.

7. A stop motion comprising a cylindrical casing of stepped formation, the upper portion being of a relatively larger diameter than the lower portion thereof, a series of thread-supporting arms extending radially from the larger portion of the casing, a series of thread-supporting arms extending radially from the smaller portion of the casing in angular spaced relation to the arms of the larger portion, a thread guide at the outer end of each arm, and a thread guide at the inner end of each arm adjacent the wall of the casing portion from which the arm extends, providing vertical, angular and radial spacing of the inner thread guides in successive order around the casing.

8. A stop motion comprising a cylindrical casing of stepped formation, the upper portion being of a relatively larger diameter than the lower portion thereof, a series of thread-supporting arms extending radially from the larger portion of the casing, a series of thread-supporting arms extending radially from the smaller portion of the casing in angular spaced relation to the arms of the larger portion, a thread guide at the outer end of each arm, a thread guide at the inner end of each arm adjacent the wall of the casing portion from which the arm extends, providing vertical, angular and radial spacing of the inner thread guides in successive order around the casing, and an independent stop motion mechanism in each of the said portions of the casing and adapted to be controlled respectively by the threads supported by the arms extending from the respective casing portions.

9. A stop motion comprising a cylindrical casing of stepped formation, the upper portion being of a relatively larger diameter than the lower portion thereof, a series of thread-supporting arms extending radially from the larger portion of the casing, a series of thread-supporting arms extending radially from the smaller portion of the casing in angular spaced relation to the arms of the larger portion, a thread guide at the outer end of each arm, a thread guide at the inner end of each arm adjacent the wall of the casing portion from which the arm extends, providing vertical, angular and radial spacing of the inner thread guides in successive order around the casing, an independent stop motion mechanism in each of the said portions of the casing and adapted to be controlled respectively by the threads supported by the arms extending from the respective casing portions, and a machine-controlling element common to both said stop motion mechanism and operable by either thereof independent of the other thereof.

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