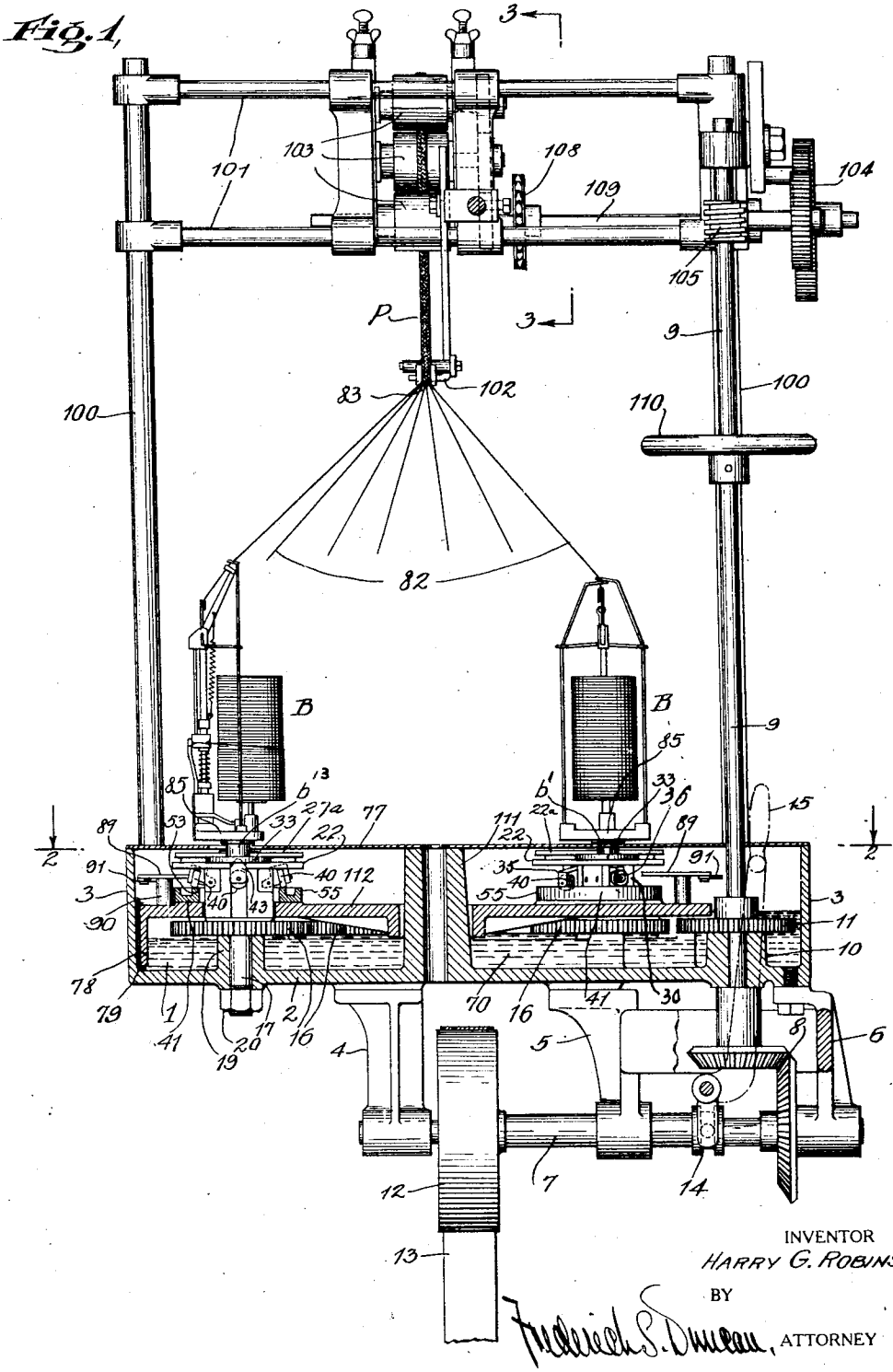
Nov. 27, 1928. 1,693,121

H. G. ROBINSON

BRAIDING MACHINE

Filed Sept. 24, 1926 4 Sheets-Sheet 1

Fig. 1.



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BRAIDING MACHINE

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Fig. 2.

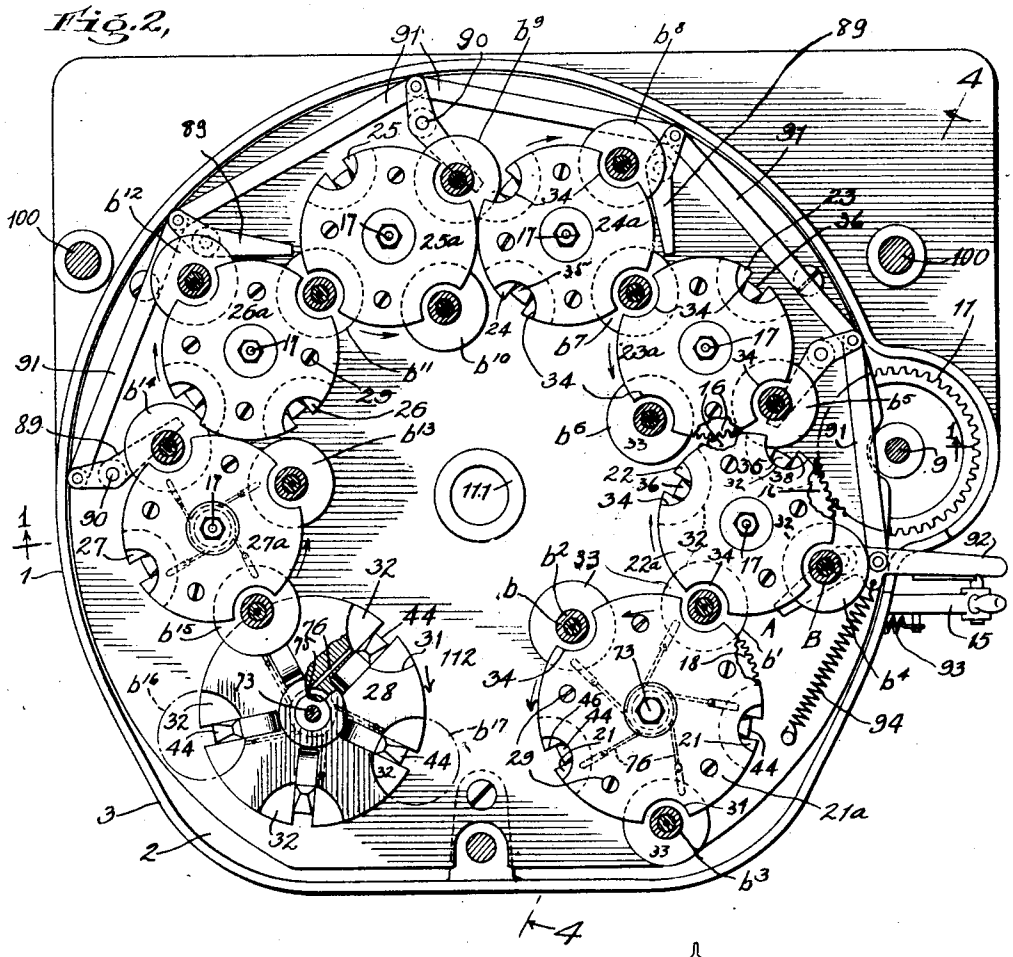

Fig. 3.

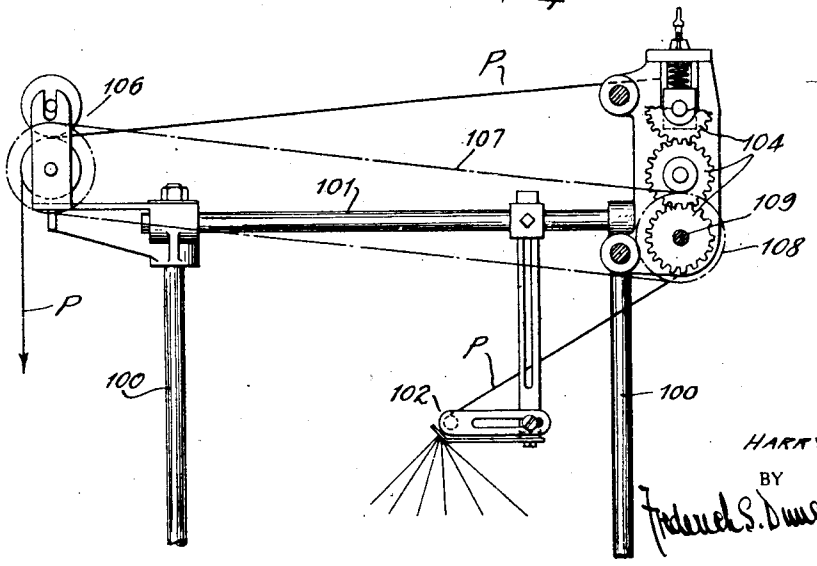

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Fig. 5.

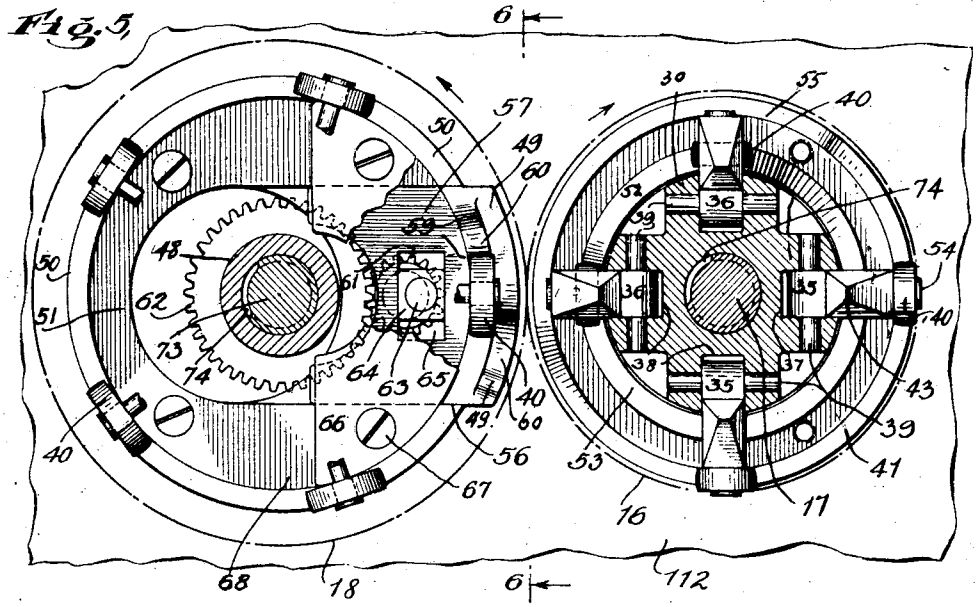
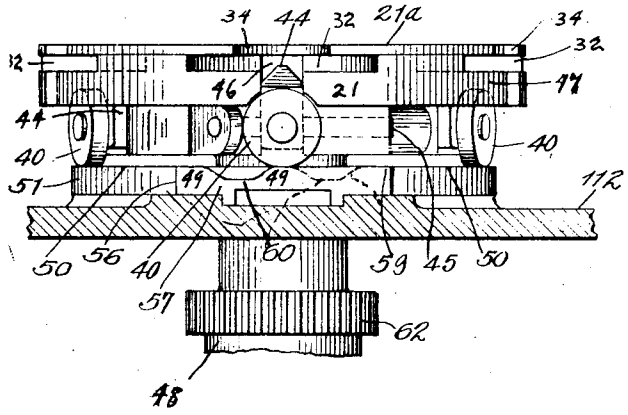


Fig. 6.



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BRAIDING MACHINE

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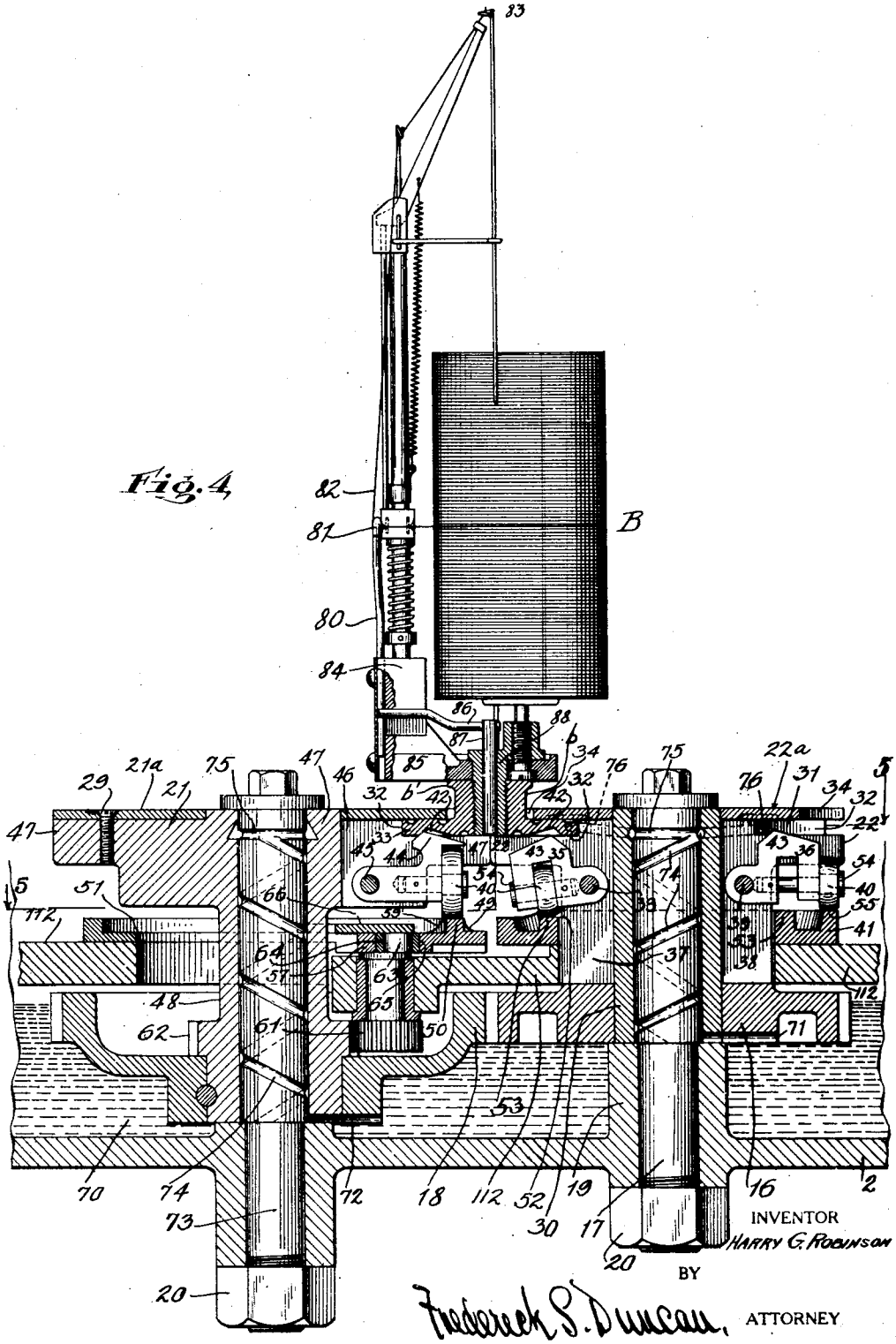
Fig. 4



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Patented Nov. 27, 1928. 1,693,121

UNITED STATES PATENT OFFICE.

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BRAIDING MACHINE.

Application filed September 24, 1926. Serial No. 137,395.

This invention relates to braiding machines and has for an object the provision of an improved braiding machine of the type in which braiding carriers are moved in intersecting sinuous paths by means of rotating drivers with devices which hold the respective carriers against the drivers at their peripheries through a portion of their rotation, and which release the carriers at appropriate transfer regions where a carrier is passed from one driver to another and is thereby carried in a reversely curved part of the sinuous path until the carrier is again transferred to the next driver of the series, and so on throughout the system of drivers.

An object of the invention is to provide the carriers with terminal flanges adapted to be held in recesses near the upper faces of the actuating drivers, and to be gripped therein by means carried on the hubs of the drivers, and acting to force the flanges against the under surfaces of removable plates covering the recesses, the machine being organized to permit unusually ready removal of the carriers for purposes of changing the carriers or inspecting the underlying parts without undue disorganization of the machine.

Another object of the invention is to provide holding devices for the above purpose in the form of dogs pivoted upon the hubs of the drivers in such balanced position as to be normally given a bias by centrifugal force and gravity away from holding position, and to provide means in the form of annular cams co-axially disposed adjacent to the drivers and adapted to force the dogs positively into holding position, so that the dogs are quick-acting and sensitive in their operations and constitute effective holding devices which do not get out of order nor deteriorate rapidly, but operate with uniform regularity and are more reliable in action than existing devices for the purpose.

Another object is to permit the use of cams which can be formed inexpensively to effect the desired movements of the carriers, and which can be exchanged quickly to produce different types of product.

Another object of the invention is to provide a machine adaptable to the manufacture of a wide variety of products, including flat and tubular braids or tapes, and which can be used in the production of such different articles as flat wire tape for tire beads, sheathing for insulated electrical conductors and delicate ric-rac in diverse patterns.

Still another object is to provide a machine which can be operated reliably at extremely high speeds and with a minimum of friction and noise, by operators of less than average skill.

Among other objects are the provision of means to effect automatically the thorough and continuous lubrication of the operating instrumentalities, and to prevent soiling of the product by the lubricant; a cognate object being the organization of the operating parts, and the lubricant circulating devices, in such a manner as to concentrate the fluff or fibres given off by certain materials and to utilize the same as a filter for the lubricant.

Another object is to provide an extremely sensitive detector mechanism adapted to stop the machine quickly upon failure of the supply or upon arrival of a defective portion of thread, before the defect can result in a flaw in the final product.

The above features, and others, are illustrated and described fully in the accompanying drawings and specification and are pointed out in the claims.

In the drawings,

Fig. 1 is a view in vertical section of a braiding machine in the construction of which the invention has been embodied, with parts shown in elevation.

Fig. 2 is a horizontal section on the line 2—2 of Fig. 1, upon an enlarged scale.

Fig. 3 is a fragmentary, detail view in side elevation of the head of the machine shown in Fig. 1.

Fig. 4 is a fragmentary, detail view in vertical section, on an enlarged scale, taken on the line 4—4 of Fig. 2.

Fig. 5 is a fragmentary, detail view in horizontal section on the line 5—5 of Fig. 4.

Fig. 6 is a transverse, vertical section on the line 6—6 of Fig. 5.

In the illustrated embodiment, the part designated by the reference numeral 1 is the casing adapted to enclose the actuating parts

of a braiding machine, approximately circular in form and comprising a bottom part 2 with side walls 3 and having brackets 4, 5 and 6 to support the horizontal drive shaft 7 which is geared at 8 to a vertical shaft 9 extending up through a boss 10 and provided with a spur gear 11 which constitutes the main driving gear of the braiding mechanism. A pulley 12 on the shaft 7 may be driven by a belt 13, and at 14 is provided a controlling clutch operated by a shipping lever 15.

Referring to Fig. 2, it will be seen that the main driving gear 11 meshes with a spur gear 16 upon a bearing stud 17, driving the gear 16 and driving thereby the gear 18 at one side of gear 11, and also the chain of gears 16 on the other side which are mounted rotatably upon bearing studs 17 in an approximately circular arrangement within the casing 1, to the bottom 2 of which the studs are secured in bosses 19 by suitable nuts 20, as shown in Figs. 1 and 4.

In pursuance of the invention, a series of carrier driver disks is provided for actuation by the gears 16 and 18, and of these disks there may be any suitable number, eight being shown in the illustrated embodiment, numbered 21 to 28, these disks being supported in such a manner as to permit the attachment to their upper faces of flanged carrier members b^1 to b^{17}, in the manner best understood by reference to Fig. 4, which illustrates also a preferred type of braider unit supported by the carrier b^1 and designated generally by the reference character B.

The driver disks 22 to 27 are preferably of substantially identical construction throughout the series, and similarly connected with their respective gears 16, so that the following description of the now preferred form of structure associated with the driver disk 22 will serve as a description of each.

The driver 22 is preferably formed integrally with a hub 30 co-axial with the gear 16, and is provided with four arcuate peripheral recesses 32 to receive the flange 33 with which each of the carrier members b^1 to b^{17} is provided, so that as each carrier flange engages with one of the transfer disks its flange 33 enters one of these arcuate recesses 32 and fits snugly against the curved wall 31 thereof, being embraced between the driver 22 and a cover plate 22^a, the latter having its periphery cut away at 34 to clear the central post or neck b of the carrier.

In pursuance of an important object of the invention, means are provided to hold the carrier positively against the disk 22 while the same rotates from the transfer point at which it receives the carrier to the transfer point at which the disk passes the carrier on to the adjacent disk, where the carrier is released and is picked up by the adjacent disk and is there held by similar positively acting means.

The now preferred form of holding means comprises two sets of dogs 35 and 36 mounted on pivots 39 in radial slots 37 and 38 formed in the hub 30 of the gear 16, the dogs being formed with yokes in which are anti-friction rollers 40 adapted to run upon a cam 41 mounted upon a stationary plate 112 extending horizontally across the casing.

All of these dogs are preferably so formed that by the action of centrifugal force and gravity they will be given a bias downwardly away from the flanges 33 of the carriers, tending normally to occupy the position of the dog 35 in Fig. 4, and in pursuance of the invention the cam 41 is provided with annular face tracks 53 and 55, of a contour respectively adapted to force the dogs 35 and 36 upwardly into the position shown in Fig. 4 at 36. In this position the shoulder 43 of the dog is adapted to enter the annular groove 42 with which the bottom of the carrier flange is provided, and serves when so engaged to prevent displacement of the carrier from the disk, crowding the carrier flange toward the curved wall 31 of the recess 32, and at the same time forcing it firmly upward against the bottom of the plate 22^a.

Such engagement is illustrated clearly in the instance of the similar dog 44 pivoted at 45 within a radial slot 46 in the face disk 47 extending from the hub 48 of driver 21, upon which disk is mounted plate 21^a, this driver being about to transfer the carrier b^1 to the disk 22, for which operation the carrier will be released by the descent of dog 44 when its roller 40 runs down an incline 49 on track 50 of the cam 51, while the pick up of the carrier b^1 is simultaneously performed by the dog 35 when its roller 40 runs up the incline 52 of the inner track 53 of cam 41, this double action of the dogs being practically instantaneous, so that no dwell is required, nor is there any shock incidental to loose motion, the carrier being swung into reverse with a smooth, steady continuity of action which causes the machine to operate quietly and reliably, and increases its effective life.

It is to be noted that all the dogs 35 have rollers 40 running on the inner track 53 of cam 41, while all the dogs 36 have rollers set upon shafts 54 of a length permitting the rollers 40 to be placed outside of the yokes in position to run upon the outer tracks 55; and the dogs 35 control the transfers of carriers outward bound from the disk 21, while the dogs 36 control the transfers of carriers bound toward the disk 21. For this purpose the dogs 35 are spaced 90° apart in their slots 37, and the dogs 36 are spaced 90° apart in the slots 38.

In the particular type of braiding machine selected for illustration, the braiding units are arranged to return upon their courses, in order to make a flat braid for which purpose the disks 21 and 28 serve to accomplish the

required change of direction, each carrier being swung around a complete circle by the disk 21 and by the disk 28 at the respective ends of the sinuous path.

Accordingly, each of the disks 21 and 28 has an extra seat 32 and a corresponding number of dogs 44, and means are provided to operate each dog to pick up a carrier at the single transfer point, occupied by the carrier b^1 in Figs. 2 and 4, and to release the carrier when the disk 21 has made a complete turn, so that one or more of the dogs 44 are always out of use on alternate rotations of the disk 21, and the same is true of the dogs on disk 28, which are identical in arrangement with those on 21.

A different type of cam motion is required to operate the dogs 44, and as the now preferred form of cam for this purpose, there may be utilized a cam 51 having a single cam track 50 of uniform height throughout its extent, except at the region of the transfer point occupied by the carrier b^1, (see Fig. 2) where there is a gap 56 in the cam track, (see Figs. 5 and 6) occupied by a slide 57 having a plurality of arcuate cam track segments 49 and 59 the inclines of which are brought alternately into position for action, by radial movement of the slide outward and inward between the times of transfer, the roller 40 of the dog running down one incline 49 (see Figs. 4 and 5) as the rotation of disk 21 brings the dog 44 near the transfer point, so that the roller 40 runs momentarily on the low path 60 of the cam slide, and at this phase of the rotation of the driver, the dog 44 at that time passing is depressed and then its roller 40 runs up the opposite incline 49, causing the dog 44 to engage and hold one of the carriers b^1, etc., this holding action being maintained by track 50 for one complete rotation of the driver 21. Then the inward shifting of the slide 57 brings one of the inclines 59 at the inner portion of the cam slide into registry with the circular part 50 of the cam track, and the roller 40 runs down one incline 59, allowing the appropriate dog 44 to fall and release the carrier b^1, or the carrier which is to be transferred to the co-operating driver 22 and that carrier is immediately picked up by the proper dog 35 on the driver 22, and which is swung around with the disk 22, until the transfer point to driver 23 is reached, and so on.

As suitable means to effect the required reciprocation of the slide 57, I have shown a gear 61 meshing with a gear 62 on the hub 48, and provided with a crank-pin 63 and slide-block 64 working in a slot 65 of the slide 57, a plate 66 being fastened by screws 67 upon the cam part 68 to hold the parts in assembled relation.

The ratio of the gear 61 to gear 62 is two and one half to one, so that the slide 57, and its cam shoulders 49 and 59, makes five complete reciprocations for each two rotations of the disk 21; and thus each dog 44 is raised and lowered once upon each complete rotation of the disk.

This insures that each carrier shall be picked up by disk 21 at a transfer point and carried completely around to the same transfer point and released for transfer after one such complete rotation of the disk.

The disks 21 and 28 may be provided with a different number of dogs than that shown, and the gear-ratio will be then varied according to the work to be performed.

In pursuance of another important object of the invention, provision is made for automatic lubrication of the various operating parts, preferably by the means now to be described:

The casing 1 serves as a reservoir for fluid lubricant, 70, which preferably is maintained at a height sufficient to reach the gears 11, 16 and 18, which accordingly derive their lubrication directly therefrom.

The hubs 30 and 47 are preferably channelled, as at 71 and 72, to give access of the lubricant to the bearing studs 17 and 73, and the latter are provided with spiral channels 74, terminating in peripheral grooves 75 to which the lubricant is elevated by the rotation of hubs 30 and 48, passing from the grooves 75 to channels 76 by which it is conveyed by centrifugal force to the carrier seats 32 and thence flows by gravity down over the dogs 35, 36, 44 and the cam tracks 50, 52, 53, 55 and their associated parts, including the slide 57, gears 61 and 62, etc., so that all the co-acting parts are constantly flushed with lubricant, automatically. A cover-plate 77 prevents escape of the lubricant, and also avoids intrusion of dirt, and to a large extent of fibre given off by some of the materials being braided.

Any fibres which may enter through such openings as may be left in the path of the carriers, will be carried by the flow of lubricant and by centrifugal force toward the walls 3 and will descend there between the horizontal plate 112 and the walls 3, a depending flange 78 on the plate providing a peripheral sump within which the fibre is felted, as at 79, constituting a filter for the lubricant, which returns thence to the central reservoir, escaping beneath the flange 78, in a purified condition, being capable of repeated use without special attention.

The above lubricating means forms the subject of claims in my co-pending application Ser. No. 255,727, filed Feb. 20, 1928.

In pursuance of another important object of the invention, means are provided to detect any breakage of thread and cause immediate stoppage of the machine.

As the now preferred form of means for this purpose, the braiding units B are provided (see Fig. 4) with devices comprising

detector wires 80 having eyes or hooks 81 through which are led the threads 82 as they pass from the bobbins B to the braiding point 83. These detector wires are mounted in slideways 84 upon the heads 85 of the carriers b^1, etc., and each has an arm 86 extending inward to a plunger 87 mounted freely in a central bore 88 of the carrier, being supported, when the thread is intact, in the position shown in Fig. 4.

If a thread 82 breaks, the detector 80 and its plunger 87 falls, and as the carrier continues in its path, the plunger is soon brought into contact with one of a series of levers 89 (see Fig. 2) mounted pivotally at 90 upon posts disposed at intervals around the periphery of the casing. By a system of connecting levers 91, any of the levers 89 so actuated will operate a latch 92 connected with the shipping lever 15 and permit the latter to be thrown by a spring 93, throwing out the clutch 14 and shutting off the power from the shaft 7.

A spring 94 holds the latch 92 in position to maintain the shipping lever normally in the position to which it is moved by the operator in starting the machine, as shown in Fig. 2.

A very sensitive stop motion is thus provided, and the impairment of product by flaws due to breakage of the braiding supply is avoided entirely.

The above stop motion forms the subject of claims in my co-pending application Ser. No. 255,728, filed Feb. 20, 1928.

The braiding units B may be of any suitable number and construction, and while a product of great variety and unusually perfect quality can be secured by the use of the braiding units shown in the drawings, it is to be understood that the specific form shown by way of example is not necessary to the carrying out of the invention comprising the features already set forth, nor is it deemed essential to describe the braiding units in detail, inasmuch as the same form the subject of a separate application, Serial No. 117,904, filed June 23, 1926.

Likewise, the overhead structure of the machine, shown in Figs. 1 and 3, constitutes one desirable form of construction to co-operate with the means herein described and claimed for actuation of the braiding units, and a brief designation of its parts will be sufficient to permit complete understanding of their intended use.

Upright posts 100, with horizontal members 101, serve to support a closing device 102 to which the braiding components 82, whether threads, wires, or other suitable components, are led from the units B, and the completed product P is drawn off through rolls 103 operated by gears 104 driven by a worm 105 on the upright shaft 9. The product is then led through a tension couple 106 (see Fig. 3) driven by a sprocket chain 107 actuated by a sprocket wheel 108 on the counter shaft 109 and delivered for accumulation in well-known fashion. A hand-wheel 110 may be provided to work the machine for adjustment when the power is shut off.

If the product is to include a wire or core on which insulating or other covering is to be braided, the same may be led to the braiding point through a central hollow post 111 with which the casing may be provided.

From the foregoing description and illustration, it will be seen that upon removal of the face plates 21^a, 22^a, etc., which can be effected readily by removal of the screws 29, after moving the carriers B^1, B^2 etc., from the face recesses 32, the latter will be exposed, together with the communication hub slots 37, 38 and 46, containing the dogs 35, 36 and 44, so that the latter may be readily inspected without otherwise dismantling the machine.

So also, by removing the drivers from their bearing posts, 17 etc., the cams 41 will be exposed and may be removed from the plate 112, and may be replaced by other cams to vary the character of the braiding operation, without disturbing the underlying gears 16.

The above provisions render the novel braiding machine herein disclosed unusually easy to operate and to maintain in working condition.

As a cognate advantage of the structure disclosed, it is possible to employ carriers of very simple construction, inasmuch as the only portion of the carrier contained within the operating part of the machine is the flange 33, and this terminal flange may accordingly be made of suitable extent radially to afford a broad upper bearing surface for contact with the lower surface of the face plates 21^a, 22^a etc., and to afford an equally broad lower bearing surface for engagement by the portions 43 and 44 of the dogs, and as the latter engage the terminal flanges directly beneath their region of engagement with the driver disks, the carriers and the braiding devices B supported thereby are firmly held for the braiding operation at all times, including the periods of transfer from disk to disk, making it possible to avoid undesirable tilting or other movements of the braiding devices relatively to the drivers. Any wear is taken by parts which are inexpensive, accessible, and easily replaced.

It is to be noted further that the important operation of releasing the holding devices at the transfer points is accomplished by a force of a continuous nature, viz: centrifugal force, which increases with the speed of operation, so that the disconnection is assured unfailingly; and inasmuch as the coupling of the carriers to the plates is effected positively by the action of the cams upon the dogs, the latter are not subject to failure of operation from any cause; and finally the provision of bev-

elled shoulders upon the under surfaces of the carrier flanges makes it possible for the dogs to position the carriers with unfailing accuracy against the inner walls 31 of the peripheral recesses of the drivers.

I claim:

1. A braiding machine characterized by rotatable drivers adapted to co-operate upon braiding devices or carriers for the transport of said carriers through a sinuous path, said drivers having holding members, rotatable with said drivers, to secure said carriers adventitiously to said drivers in succession, said machine being further characterized by the arrangement of said holding devices to be biased from holding position by the action of centrifugal force, and also characterized by means acting positively to move said holding members into position to secure said carriers to said drivers successively, said means being adapted to release said holding members at the transfer regions and thereby to permit transfer of said carriers from driver to driver.

2. A braiding machine as in claim 1 in which the rotary drivers have peripheral recesses adjacent to their upper faces to receive the carriers.

3. A braiding machine as in claim 1 in which the rotary drivers have peripheral recesses adjacent to their upper faces to receive the carriers, and the carriers are formed with terminal flanges to enter said recesses.

4. A braiding machine as in claim 1 in which the rotary drivers have peripheral recesses adjacent to their upper faces to receive the carriers, and the carriers are formed with terminal flanges to enter said recesses, said holding members being adapted to force said flanges toward the axes of said drivers into firm engagement with the inner walls of said recesses.

5. A braiding machine as in claim 1 in which the rotary drivers have their upper faces recessed to receive the carriers.

6. A braiding machine as in claim 1 in which the rotary drivers have their upper faces recessed to receive the carriers, and removable face-plates to close said recesses.

7. A braiding machine as in claim 1 in which the rotary drivers have their upper faces recessed to receive the carriers, and removable face-plates to close said recesses, and said holding members are adapted to hold said carriers against the under faces of said plates.

8. A braiding machine as in claim 1 in which the rotary drivers have their upper faces recessed to receive the carriers, and removable face-plates to close said recesses, and said holding members are adapted to hold said carriers against the under faces of said plates, and to force the carriers inward against the walls of said recesses.

9. In a braiding machine a series of rotary drivers having respectively face disks recessed peripherally to receive braiding devices or carriers provided with flanges, said drivers having holding members adapted to engage said flanges and hold the same against the inner walls of said recesses.

10. In a braiding machine a series of rotary drivers having respectively face disks recessed peripherally to receive braiding devices or carriers provided with flanges, said drivers having holding members adapted to engage said flanges and hold the same against the inner walls of said recesses and in combination therewith a series of carriers having terminal flanges.

11. In a braiding machine a series of rotary drivers having respectively face disks recessed peripherally to receive braiding devices or carriers provided with flanges, said drivers having holding members adapted to engage said flanges and hold the same against the under surfaces of said face disks, and in combination therewith a series of carriers having terminal flanges provided with annular shoulders upon their terminal faces.

12. In a braiding machine a series of rotary drivers having respectively face disks recessed peripherally to receive braiding devices or carriers provided with flanges, said drivers having holding members adapted to engage said flanges and hold the same against the under surfaces of said face disks, and in combination therewith a series of carriers having terminal flanges provided with annular shoulders upon their terminal faces extending beneath said face disks and adapted to be engaged by said holding members.

13. A braiding machine as in claim 1, in which the means to move the holding members comprises a cam fixed adjacent to the driver whose holding members are actuated thereby.

14. A braiding machine as in claim 1, in which the means to move the holding members comprises a cam fixed adjacent to the driver whose holding members are actuated thereby, said cam being of annular form.

15. A braiding machine as in claim 1, in which the means to move the holding members comprises a cam fixed adjacent to the driver whose holding members are actuated thereby, said cam being of annular form and having face-tracks arranged co-axially with respect to said rotary driver.

16. A braiding machine as in claim 1 in which the holding members are constituted by dogs mounted pivotally on the rotary drivers.

17. A braiding machine as in claim 1 in which the holding members are constituted by dogs mounted pivotally on the rotary drivers, and the actuating means comprise a cam having an annular face track arranged co-axially with respect to the rotary driver and adapted to force said dogs upwardly against the carrier.

18. A braiding machine as in claim 1 in which a base is provided with upright bearings for the rotary drivers, and an auxiliary base plate is provided with annular cams arranged co-axially with respect to said drivers.

19. A braiding machine as in claim 1 in which a base is provided with upright bearings for the rotary drivers, and an auxiliary base plate is provided with annular cams arranged co-axially with respect to said drivers beneath the drivers.

20. A braiding machine as in claim 1 in which a base is provided with upright bearings for the rotary drivers, and an auxiliary base plate is provided with annular cams arranged co-axially with respect to said drivers beneath the drivers, said drivers having hubs extending downwardly through said cams and provided with intermeshing gears beneath said cam plate.

21. A braiding machine as in claim 1 in which a base is provided with upright bearings for the rotary drivers, and an auxiliary base plate is provided with annular cams arranged co-axially with respect to said drivers beneath the drivers, said drivers having hubs extending downwardly through said cams and provided with intermeshing gears beneath said cam plate, the hubs having radial slots with dogs mounted pivotally in said slots above said cams, and adapted to be operated thereby to hold said carriers.

22. A braiding machine as in claim 1 in which a base is provided with upright bearings for the rotary drivers, and an auxiliary base plate is provided with annular cams arranged co-axially with respect to said drivers beneath the drivers, said drivers having hubs extending downwardly through said cams and provided with intermeshing gears beneath said cam plate, the hubs having radial slots with dogs mounted pivotally in said slots above said cams, and adapted to be operated thereby to hold said carriers, the upper faces of said drivers having peripheral recesses communicating with said slots and adapted to receive said carriers.

23. A braiding machine as in claim 1 in which a base is provided with upright bearings for the rotary drivers, and an auxiliary base plate is provided with annular cams arranged co-axially with respect to said drivers beneath the drivers, said drivers having hubs extending downwardly through said cams and provided with intermeshing gears beneath said cam plate, the hubs having radial slots with dogs mounted pivotally in said slots above said cams, and adapted to be operated thereby to hold said carriers, the upper faces of said drivers having peripheral recesses communicating with said slots and adapted to receive said carriers, and cover plates upon the drivers in position to close said recesses, serving as abutments against the under surfaces of which the carriers are held by said dogs.

24. A braiding machine as in claim 1 in which a base is provided with upright bearings for the rotary drivers, and an auxiliary base plate is provided with annular cams arranged co-axially with respect to said drivers beneath the drivers, said drivers having hubs extending downwardly through said cams and provided with intermeshing gears beneath said cam plate, the hubs having radial slots with dogs mounted pivotally in said slots above said cams, and adapted to be operated thereby to hold said carriers, the upper faces of said drivers having peripheral recesses communicating with said slots and adapted to receive said carriers, and cover plates upon the drivers in position to close said recesses, serving as abutments against the under surfaces of which the carriers are held by said dogs, and means to secure said cover plates to said drivers removably, whereby, upon removal of said cover plates and carriers, said dogs and cams are exposed.

25. A braiding machine as in claim 1 in which a base is provided with upright bearings for the rotary drivers, and an auxiliary base plate is provided with annular cams arranged co-axially with respect to said drivers beneath the drivers, said drivers having hubs extending downwardly through said cams and provided with intermeshing gears beneath said cam plate, the hubs having radial slots with dogs mounted pivotally in said slots above said cams, and adapted to be operated thereby to hold said carriers, the upper faces of said drivers having peripheral recesses communicating with said slots and adapted to receive said carriers, and cover plates upon the drivers in position to close said recesses, serving as abutments against the under surfaces of which the carriers are held by said dogs, and means to secure said cover plates to said drivers removably, whereby, upon removal of said cover plates and carriers, said dogs and cams are exposed, and said drivers being removable from said bearings to expose said annular cams, so that the latter may be removed and replaced while said gears are left in place.

26. A braiding machine as in claim 1 in which a base is provided with upright bearing posts for the rotary drivers, and an auxiliary base plate is provided with annular cams arranged co-axially with respect to said drivers.

27. A rotary driver for braiding machines, said driver comprising a hub having longitudinal slots and peripheral face recesses communicating with said slots, said face recesses being adapted to receive flanged carriers, and holding members mounted in said slots and adapted to engage said flanged carriers retentively.

28. A rotary driver for braiding machines, said driver comprising a hub having longitudinal slots and peripheral face recesses communicating with said slots, said face recesses being adapted to receive flanged carriers, and holding members mounted in said slots and adapted to engage said flanged carriers retentively, and a cover plate for said face recesses, said cover plate serving as an abutment against the under surface of which said carriers may be held by said holding members.

29. A rotary driver for braiding machines, said driver comprising a hub having longitudinal slots and peripheral face recesses communicating with said slots, said face recesses being adapted to receive flanged carriers, and holding members mounted in said slots and adapted to engage said flanged carriers retentively, said holding members comprising dogs mounted upon pivots carried by said hub transversely of said slots.

30. A rotary driver for braiding machines, said driver comprising a hub having longitudinal slots and peripheral face recesses communicating with said slots, said face recesses being adapted to receive flanged carriers, and holding members mounted in said slots and adapted to engage said flanged carriers retentively, said holding members comprising dogs mounted upon pivots carried by said hub transversely of said slots, and having radial shafts provided with anti-friction rollers.

31. A holding member for a rotary driver in a braiding machine of the class described, said holding member comprising a dog having a shoulder adapted to be engaged retentively with a flanged braiding device or carrier, and a shaft provided with an anti-friction roller, said dog having a yoke adapted to serve as a lateral bearing for said roller in either of a plurality of positions on said shaft.

32. In a braiding machine having a plurality of rotary drivers co-operating to transport and transfer braiding devices or carriers, the combination with a rotary driver having holding members for said carriers of a cam to actuate said holding members, said cam comprising a member having an interrupted annular cam track and a cam part movable into and out of alignment with said cam track at the interrupted region thereof, and means connected with said rotary driver to cause reciprocation of said cam part at intervals to release said holding members successively.

33. In a braiding machine having a rotary driver provided with a plurality of holding members, a cam having an interrupted annular track adapted to be engaged by said holding members successively and to cause retentive engagement thereof with said carriers in succession, said cam comprising a slide bearing a cam section with a plurality of differently positioned cam track portions adapted to be brought alternatively into alignment with said main annular cam track at the interrupted portion thereof.

34. In a braiding machine having a rotary driver provided with a plurality of holding members, a cam having an interrupted annular track adapted to be engaged by said holding members successively and to cause retentive engagement thereof with said carriers in succession, said cam comprising a slide bearing a cam section with a plurality of differently positioned cam track portions adapted to be brought alternatively into alignment with said main annular cam track at the interrupted portion thereof, said slide being geared to said driver, whereby the reciprocation of said slide is co-ordinated with the rotation of said driver relatively to said cam track.

In testimony whereof, I have signed this specification.

HARRY G. ROBINSON.