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(54) Apparatus for controlling the winding up and unwinding on rolls of toweling or the like.

(57) The apparatus (Fig. 4) controls the unwinding and the winding up of rolls of toweling, wherein roll B_1 during winding up is held on a wind-up roller 160 whose journals 162 are engaged in grooves 164 of two bars 166 mounted on support plates E_1 and E_2 of the support structure E of the apparatus. The weight of the roll B_1 being wound up rests on the periphery of a pull roller 92 actuated by gear means F_2 ending in a pull roller 48, which, in turn, is actuated by the pull exerted by the user on a loop B_6 formed by a length of toweling B between the roll B_1 and the unwound roll B_2. The latter roll is rotatably disposed on an arcuate bottom of a pivotable receptacle A_3 supported on a base plate A_1 of the cabinet A of the apparatus on a slidable pivot 14. The other end of plate B_6 extends either through an interspace 38 or between two bars 156-158; all said parts are located rearwardly of the base A_1. Suitable devices F_2, F_3, actuated by the pull roller 48, control by sensing means F_4 either the length of the loop B_6 from time to time formed beneath the cabinet A of the apparatus or the withdrawal on the wound-up roll B_1 of the end of the toweling being unwound from unwinding roll B_2.

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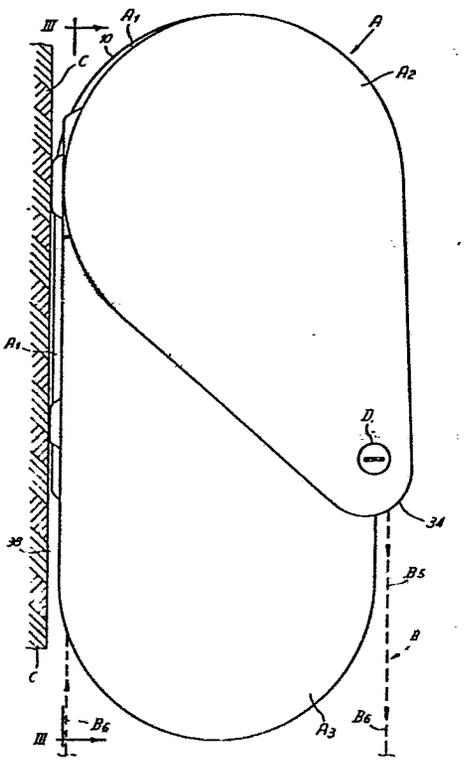
FIG.1



The invention relates to an apparatus for controlling the winding up and the unwinding of toweling or the like. The toweling used in public places is generally made of well-known textile fabrics wound on rolls, and held by suitable support members which control the unwinding and the winding up of the toweling. These operations are performed by a user who pulls or draws a length of projecting toweling to form a loop beneath the apparatus. The loop of toweling used from time to time is replaced by a new length of toweling which is again unrolled and wound up on the relative rolls, and so forth.

In the heretofore apparatus the end of the roll of clean toweling is signlaed to the user by the end of the toweling extending beneath the apparatus; this alerts to the need of replacing the roll of soiled toweling by a new roll. It will be appreciated that at the end of the use of every roll there always extends from the cabinet of the apparatus the end of the soiled toweling, previously wound on the relative roller. This situation is quite inconvenient and entails to a certain extent limited distribution and use of such apparatus. For example, many users can use the end portion of the extending toweling; also, such users can pull such end portion and thereby unwind the reel of the soiled toweling and even break the apparatus or cause other troubles. The problem

is also aggravated in that the end portion of the extending toweling suspended from the apparatus is not controlled any more by the dispensing apparatus, it remains at the mercy of unauthorized tamperers who may even remove the toweling.

The invention aims at eliminating these disadvantages by withdrawing to the interior of the cabinet of the apparatus the end run of the roll at the termination of the unwinding of the roll.

Another object of the invention is to provide an apparatus adapted to control the unwinding and the winding up of toweling, in a simple and practical way, ensuring that the placing and the replacing of new rolls and of the soiled ones are promptly handled even by persons of limited mechanical skill and without the use of tools of any kind.

Still another object of the invention is to provide an apparatus of the described type which, in addition to ready replacement of new and soiled rolls, attains the goal of varying and controlling with equal ease and readiness the length of the loop extending from the cabinet of the apparatus.

And finally, still another object of the invention is to provide an apparatus which, together with the aforementioned objects, eliminates the possibility of unauthorized tampering.

The apparatus of the invention encompasses two rolls or rollers of towleing, respectively for unwinding and winding up, and so located that a length of toweling between said rolls forms outside the apparatus a loop of predetermined length, which is successively advanced, time after time, the initial run of the loop being controlled by sensing means responsive to the user's pull. The apparatus also comprises an energy accumulator connected via unidirectional engaging means to wind-up means, there being provided means for winding said accumulator in

operative communication with control means, actuated by the unwinding of a run of the loop; there are provided locking members for said accumulator, controlled by sensing means and in communication with the initial portion of the loop for revealing its presence in such manner that, when said sensing means signal the absence of the initial length of the loop, there are released the locking members of the energy accumulator, thereby actuating via unidirectional clutch means said wind-up means to retract to the interior of the apparatus the terminal length of the loop projecting from said apparatus.

Expediently, the energy accumulator connected to the wind-up means incorporates springs, preferably a coil spring. One end of a spring is attached to a box accommodating said spring and the other end, via a speed reducer, to wind-up means of the toweling, a clutch means of unidirectional friction being disposed between said toweling wind-up means and a speed reducer, to limit the load on the springs and to rotate in the proper direction said toweling wind-up means at the end of the unwinding of the roll.

The invention will now be described with reference to the accompanying drawings which, by way of example, illustrate a preferred embodiment of the apparatus which controls the unwinding and the winding up of toweling whose ends are in the form of rolls. The illustrated apparatus also comprises means for controlling the intermittent unwinding of the toweling and other means for automatically retracting a length of the end of the toweling from the exhausted roll. More particularly:

Figure 1 is a side elevational view of the apparatus of the invention in the servicing position,

Figure 2 is a front elevational view of Figure 1 with some parts of the cabinet being removed,

Figure 3 is a partial transverse cross section

along line III-III of Figure 1,

Figure 4 is a cross section along line IV-IV of Figure 3;

Figures 5 and 6 are cross sections along lines V-V and Vi-VI of Figure 2,

Figure 7 is a cross section along line VII-VII of Figure 3,

Figures 8 and 9 are cross sections developed in the plane of two control groups, illustrated in Figures 5 and 6,

Figure 10 shows, on an enlarged scale, the view of the end of the reduction group for the automatic rewinding of a length of the end loop,

Figure 11 is a diametrical cross section of Figure 10.

It will be seen from the figures, and particularly from Figs. 1 and 7, that the illustrated apparatus embodies a cabinet A of substantially elliptical transverse cross section and comprised of three stationarily joined members which form three chambers to stationarily and in juxtaposed positions accommodate two toweling rolls B_1 and B_2; and intermediate suitable length of toweling projects beneath said cabinet A.

More specifically, cabinet A comprises a base plate A_1 mounted and suitably anchored to wall C, for example, by screws C_1. The upper edge 10 of the base plate A_1 supports by means of hinges 12 a cover A_2, whose upper part is arcuate and which, jointly with said base plate, defines a semicircular chamber to receive the roll of soiled toweling B_1, which, on being unwound from roll B_2, is rewound in a manner hereinafter described.

Downwardly, the base plate A_1, supports a second cover A_3 constituting a pivotable receptacle having a semicylindrical bottom to rotatably accommodate toweling roll B_2 such that the initial run B_4 is unreeled outside the cabinet A in a manner which will presently be

described. Upwardly, the pivotable receptacle A_3 comprises, in correspondence with its rear wall, a cross-piece 14 (see Figs. 4 and 7) whose ends constitute slide journals which cooperate with guide bars 16 provided beneath the base plate A_1. The ends of the slide cross-piece 14 also provide two pivots for movably holding the pivotable receptacle A_3 so that, in addition to swinging around said pivots, it can be horizontally shifted along the bars 16 until it reaches position 14' arrested by catches 15 of Figure 7 to make possible the introduction into such cover of the roll B_2 of the toweling to be unwound.

Cover A_2 and receptacle A_3 are held in engagement either with base plate A_1 or with each other by conveniently disposed latches. More specifically, and as illustrated in Figure 7, the front wall of cover A_2 downwardly presents brackets 18, which hold corresponding zip-like hooks 20 in angular joint relation on a polygonal plate 22 whose ends are conveniently supported for simultaneous rotation. Hooks 20 are rotated in the clockwise direction (Fig. 7) by the action of the corresponding flexible blades 23, whose free ends slidingly engage a projection interiorly presented from cover A_2. In the action of the flexible blades 23, together with said cover participate catch nibs 24 associated with the corresponding hooks 20.

Every hook 20 ends at its free end with an aperture 26, in which is engaged a tooth 28 supported at the front end of each of guide bars 16 integral with the base plate A_1. The front wall of the pivotable receptacle A_3 is provided near its edge with two windows 30, in which are engaged flexible teeth 32 provided at the ends of the guide bars 16 for holding said receptacle locked in a closed condition.

The front wall of cover A_2 substantially projects relative to the corresponding wall of the pivotable receptacle A_3 and the lower edge 34 is arcuate and

extends to conceal the windows 30. In addition, said arcuate edge 34 is provided, in correspondence with the windows 30, with tongues 33 which engage the lower portions of said windows thus to lock the flexible teeth 32 in the closed position. When the cabinet is closed, the end of the arcuate edge 34 is disposed to be at a convenient distance from an edge 35 provided in the upper portion of receptacle A_3 to form a slot through which passes and exits from the cover a run of the toweling B_5, as will be later described.

The two tongues 33 (see Fig. 7) are wedge-shaped and by flexible force are engaged between the lower areas of windows 30 and are at the upper part limited by flexible teeth 32. In such way there is provided a locking chain for the movable parts A_2 and A_3 of the cabinet A facing hooks 20 which in the illustrated case are actuated by a lock D comprising one of the side walls of the cover A_2 (Figure 1).

The result is that when lock D is actuated, hooks 20 become disengaged from the corresponding teeth 28, and the cover A_2 is permitted to swing around hinges 12 in a counter-clockwise direction and is lifted to thus give access for removal of roll B_1 of soiled toweling.

The lifting of upper cover A_2 gives better access to the ends of flexible teeth 32 presented by the guide bars 16; the action thereon releases receptacle A_3 which can now swing and move, with the ends of the cross-piece 14, along guide bars 16, to open said receptacle for receiving a new roll B_2 of the toweling to be unwound. In an inverted operation, covers A_2 and A_3 are closed and blocked to the base plate A_1.

The base plate A_1, in addition to the movable parts A_2 and A_3, also supports a support frame E for a first complementary device F_1 which controls the un-

winding of toweling B from roll B_2 and the winding-up of the soiled toweling on roll B_1. The support frame E comprises two vertical plates E_1 and E_2, which are stationarily joined to said base body by stationary connecting means, provided by pairs of small plates E_3 having slots and cooperating surface to surface with said vertical plates. The small plates E_3 are perforated for holding either screws E_4 which lock the support frame E or for holding in spaced vertical relationship vertical plates E_1 and E_2 such that toweling B can unobstructedly run therebetween as will be described presently.

In addition, plate E_1 comprises also a device F_2 for determining and controlling the length of toweling B_6 extending outside of the apparatus in order to form a loop of predetermined length.

The other plate E_2 accordingly holds another device F_3 which at the end of the unwinding of the roll B_2 (and, consequently, the winding-up of roll B_1) automatically intervenes for retracting to the interior of cabinet A the final portion of the toweling from roll B_2 to be wound up on roll B_1.

It will be appreciated that, as already pointed out, roll B_1 of the unwound toweling is rotatably disposed within the pivotable receptacle A_3 such that the initial portion of toweling B_4 (see Figure 4) is free to unwind and is at a distance from the front wall of said receptacle. But the lower side, predominantly to the left of roll B_2 of Figure 4, co-operates with a wall 36 raised and extending inside the pivotable receptacle A_3 and ending below the arc coinciding with the arcuate bottom of said receptacle A_3. The projecting wall 36 forms with the building wall an interspace 38 of a width substantially equal to the width of the loop B, to permit free passage of the loop during the winding up on the wind-up roll B_1. The path of the loop B from

the unwinding roll B_2 to the winding-up roll B_1 is along the path seen in Figure 4. The toweling B_4 of the loop unwound from roll B_2 passes through a guide aperture defined by either adjacent edges of two flexible teeth integral with guide bars 16 or by the arcuate edge 34 of cover A_2 and a rib 35 of the receptacle A_3.

The end B_4 of the loop passes through a pair of rollers 40-42; the first of these rollers is supported by a pair of arms journaled in pivots 45 on support plates E_1 and E_2.

Roller 42 of the pair 40-42 is rotatably supported by plates E_1 and E_2 and is operatively connected to two devices F_2 and F_3 in a manner which will be explained later, thus constituting a drive roller or a pull roller when the initial portion B_4 of the unwound loop is wound thereon. For ensuring the operative match of the pull roller and of the toweling loop B_4, the periphery of said roller is made rough and rugged, for example, by knurling or by adhesively attaching suitable grains, thus ensuring the adherence of the textile fabric constituting the toweling loop B.

Roller 20 adheres to pull roller 42 due to the retractive action of springs 46 which are on one side anchored in the ends of arms 44 and on the other side in plates E_1 and E_2.

The initial portion of loop B winds up on roller 42 on a width exceeding 180°, and the following portion B_5 is downwardly directed and passes to the outside of cabinet A through a calibrated slot 34-35 which was already described and which is defined by the arcuate lower edge 34 and the transverse rib 35 of the pivotable receptacle A_3, thus to form the initial portion of the loop B_6 of toweling B, to be positioned beneath cabinet A.

The toweling portion B_5 between the pull roller 42 and the calibrated slot 34, now described, is controlled by spring-loaded sensing member F_4, successively disposed in such path. The first sensing member (see Figs. 4 and 6) comprises a pair of transverse ribs 50-52, located rearward of the lower zone of cover A_2 with suitably spaced members, the tops being rounded and used for moving the initial portion B_5 of the loop coming from the pull roller 42. With this portion of the toweling cooperates the medium portion 54 shaped with the slotted strip of a spring-loaded strap 54, 55 so disposed that the slot of said strip receives the upper rib 50 of said pair 50, 52. The ends of arms 55 of the bracket 54-55 are supported in pivots provided in support plates E_1 and E_2, and spring-biased means 120 (which will be described hereinafter) actuate said bracket to act on a run of toweling B_5 between the pairs of ribs 50-52 thereby to control the presence of the toweling. Bracket 54-55 operatively engages, as will be later described, device F_3, supported by support plate E_2 to automatically rewind on roll B_1 the final portion of the toweling unwound from roll B_2.

Following the sensing means 54-55, there is disposed a second sensing means, comprising a rod 56 integral with a pair of arms 58 (see Figures 5 and 6) having their free ends held in support sleeves on shaft 48 of the draw roller 42 to swing, independently of the rotation of said roller.

Sleeve 56 of the second sensing means 56-68 is pressed by springs 62 against a flexibly yieldable pad, said springs being held by said arms and anchored in the support plate E_1. The said pad is disposed at the bottom of a cavity defined by the lower rib of the pair 50-52 and by a further rib 64 parallel to said rib 52, thus to provide a second pair of ribs 52-64

successive to the first pair, whereby rib 55 is in common with said pairs. As already said, the pairs of ribs 50-52 and 52-64 are attached to the front wall of the cover A_2 such that their tops consistently cooperate with the run of toweling B_5 coming from the draw roller 42. The action of springs 62 on arm 56 of the second sensing means 56-58 presses the length of toweling B_5 betweem the pair of ribs 52-64 against the flexible pad 60, thus imparting to said length of toweling the shape of a loop of limited length, which is undone by the drawing action exerted by the user on said length of toweling B_5, as will be later described.

In addition, the action exerted by springs 62 on the second sensing means 56-58 is greater than the action exerted by springs 120 (as will be later described) on the first sensing means 54-55 such that the length of toweling B_5 between the pair of ribs 50-52 is not bent by the pair 54 of said first sensing means.

Also, the second sensing means 56-58 of the sensing means F_4 is operatively connected, as will now be described, to the device F_2, supported by plate E_2 and regulating the length of the loop of toweling B_6, which extends beneath the cabinet A, and is available to the user.

The device F_2 is shown in Figures 5 and 8; one of arms 55 of the second sensing means 56-58 laterally presents a tongue 65 with which is connected rod 66 engaging the edge of a strut 68 pivoted in a pivot 70 in the support plate E_1. At the lower end of the strut 68 is pivoted a lever 72 biased by a return spring 74, having its other end held by said strut, whose action tends to rotate counterclockwise said strut 68 and clockwise lever 72 to hold said parts mutually adjacent, said parts being free to swing around said pivot 70. The group 68-72 is held pivotable around pivot 70

and is braked by a friction washer 75 provided in the hub of said group and frictionally engaging support plate E_1.

When the sensing rod 56 is pressed by spring action 62 against the flexible pad 60, rod 66 of the second sensing means 56-58 engages the strut 68 and holds said strut within the trajectory of a catch 76 keyed to the shaft 48 of the draw roller 42. This stops the unwinding of toweling B from the lower roll B_2. The swinging in the clockwise direction of the group: strut 68, lever 72 (which takes place when the strut is not held by catch 76), is limited by a tooth 78 joined with strut 68 and engaging a tongue provided below the support plate E_1. To the pivot 48 of the draw roller 42 and laterally to the catch 76 is keyed a pinion 80 in engagement with the set of reducing gears 82-84 whose individual gears are supported in support plate E_1 by the respective support pivots 86 and 88. The gear 84 of the set of gears 82-84 actuates a system of gears 90, a draw roller 92 for the soiled toweling B_2 wound on roll B_1 and whose shaft 94 is supported by plates E_1 and E_2.

Toothed wheel 82 is joined to a pinion 95 which actuates a respective toothed wheel 96, coaxial with pinion 84 and held by the same pivot 88. The disk of said wheel 96 has a fixed rod 98 with which cooperates the end of a tongue 100 provided at the free end of lever 72. The disk of toothed wheel 96 has a plurality of apertures 102 disposed on the same circumference and angularly spaced relative to the fixed rod 98 and in an expedient way one from the other, said apertures being adapted to commutatively engage a movable rod 104 provided at one of the ends of a cross-piece connected to said wheel 96 by a fixed rod 105. The movable rod 104 extends from the disk 96 in the same way relative to the fixed rod 98, while rod 105 does not project

from said disk, so that said rods 98 and 104 are engaged by tongue 100 of the lever 72. Obviously, rod 104 can be engaged in any of apertures 102 of wheel 96 to vary the length of toweling B projecting from cabinet A and thus the length of loop B_6, as will be later described.

There will now be described device F_3 for automatically withdrawing the final length of toweling from roll B_2 at the end of the unwinding from the same. With reference to Figs. 9 and 10, a rod 106 cooperates with one of the arms 55 of the first sensing means 54-55, said rod being one of the two arms of a rocker 108 rotatably supported by shaft 48 of the draw roller 42, such that said rocker can swing independently of the rotation of the latter.

The other arm 110 of rocker 108 engages, via a rod 112, the molded slot 114 longitudinally provided at one of the ends of a pawl 116, biased by a spring 115 and supported in a pivot 118 in the lateral support plate E_2. A spring 120, anchored on one side of the pawl 116, and on the other side in said support plate E_2, exerts its action, in addition to the action on the pawl, also on the rocker 108 to impart to said rocker a counterclockwise swinging movement to engage the first sensing means 54-55 with the length of toweling B_5, arranged to communicate with a pair of ribs 50-52.

The width of the swing of the pawl 116 is controlled by a stop tooth 122, which engages a projecting portion of the support plate E_2. The action of the withdrawal spring 115 keeps in engagement the pawl 116 with the plurality of saw teeth 124 (see also Figure 10) provided on the periphery of a cylinder 126 rotatably supported on shaft 94 of the draw roller 92.

A coil spring 128 is disposed in the cylinder 126 and its outer end is anchored in the peripheral wall of said cylinder 126 (via friction means 130 to

avoid overload of said spring), while the inner end 132 is anchored in a sleeve 134 joined with a crown with inside teeth 136 and disposed to rotatably support cylinder 126. The crown with inside teeth 136 is so disposed as to correspond with one of the side ends of the cylinder 126 with which are engaged the teeth of a toothed wheel 138 rotatably supported by an eccentric 140 joined with shaft 94 of the draw roller 92. Correspondingly, the group comprises the sleeve 134, and the crown with inside teeth 136 is rotatably supported by shaft 94 of the draw roller 94, and said shaft is torsionally bound with the cylinder 126 of the spring 128 via a unidirectional clutch member 130, which will be later described.

The toothed crown 136, wheel 138, and eccentric 140 which engages the walls of a mounted aperture 142 in a swinging plate 144 provide an epicyclic set of wheels with a high reducing ratio; assuming in the illustrated case that the numbers of teeth of the crown 138 and the wheel 138 are respectively 60 and 58, it is possible to obtain a reducing ratio of 1:30, so that when eccentric 140 turns 30 times, cabinet 126 and, consequently, spring 128 are loaded for one rotation. Wheel 138, which constitutes the satellite of the epicyclic set of wheels, presents on its free surface a rod 145, which engages the radial apertures provided either in plate 144 or in support plate E_2. Such plate 144 is held between wheel 138 and the outer surface of the support plate E_2. In addition, plate 144 in a position orthogonal to the axis of rod 145 presents two other rods 146 which engage respective apertures provided in the support plate E_2, to prevent, on one side, the rotation of the group: wheel 138-plate 144-and permit, on the other side, the transmission movement of said wheel 138.

Cylinder 126 is forcibly closed by a cover 148,

which thus supports a coil spring 128 during the loading and which torsionally communicates with the draw roller 92, according to a predetermined direction of rotation of the latter. For such purpose, between shaft 94 of said draw roller 92 and sleeve 134 of spring 128, there is provided a unidirectional joint 130. Such joint is provided by a coil spring 150, whose coils flexibly engage a countersleeve 152, dovetailed in shaft 94 of the draw roller 92, the free end 154 being attached to cover 144, 148 of cylinder 126, thereby to determine the unidirectional torsional bond between shaft 94 and the end 132 of the coil spring 128.

Returning now to the trajectory of the toweling B from the lower unwinding roll B_2 to the upper wind-up roll B_1, and more particularly, to Figure 4 of the drawings, the upper portion B_7 of the loop B_6 of the soiled toweling is upwardly directed and threaded through the slot 38. Two guide bars 156 and 158 respectively associated with over-turning container A_3 and base plate A_1 convey the length of toweling B_7 to the inside of the cover A_2, where is disposed a detachable wind-up roller 160, on which expediently is attached the end B_8 of the soiled toweling. At the beginning of the winding up of the used toweling on the wind-up roller 160, the latter - or more precisely the end B_8 - by its own weight engages the draw roller 92, thus to actuate the rotation and successively wind-up the toweling B_7.

The operative bond between the draw roller and the being formed roll B_1 is provided by the weight of such roll being formed. Guiding from roll A_1 is carried out by providing the wind-up roll 160 with pivots 162, which extend in slots 164 longitudinally provided in bars 166, laterally attached to support plates E_1 and E_2.

Downwardly, the slots 164 are closed and upwardly are open, and the front edges of the same are joined with inclined planes with slots 168, extending toward the aperture of the cover A_2. In addition, slots 164 are so oriented as to have their median longitudinal axis to be substantially tangential to the draw roller 92, and upwardly to intersect the extension of the vertical diameter of the unwinding roll B_2.

When roll B_2 has completed the winding up of the soiled toweling B_7, the same assumes the position indicated by a dotted line in Figure 4, and it can readily be detached and removed, due to the provision of guide tongues 170 beneath said slots 168 in bars 166, said tongues being provided in the support plates E_1 and E_2 which are downwardly inclined and directed toward the aperture provided by the cabinet A when the cover A_2 is lifted.

In order to facilitate assembly, and specifically, to check and control the described apparatus, devices F_1, F_2, F_3, and F_4 are embodied in members stationarily supported by support plates E_1 and E_2, which are interconnected; expediently, they form a frame stationarily attached to the base plate A_1 of the cabinet A by means of stationary joining members E_3 and E_4, provided between said members.

The above description should make obvious the function of the apparatus. The placing of said unwinding roll B_2 within container A_3 takes place rapidly by opening cover A_2 and lowering said container A_3. The unwind roll B_2 is guided and centered within the container A_3 by arcuate ribs 174 at the bottom of said container, said ribs limiting a portion of the edges of the rear wall 36 of said container. The end or the free top B_4 of toweling B which is unwound from roll B_2 is caused to pass between rolls 40 and 42 and is wound up on the lat-

ter to be downwardly deflected and to engage with the descending length B_5 the sensing rods 54 and 56 of two sensing means 54-55 and 56-58. The end of the unwound toweling B is downwardly extended by a suitable length and such as to form the loop B_6 and the end B_7 of such loop is threaded through the slot 38 at the rear of the cabinet A and threaded between two guide bars 156 and 158. The wind-up roll 160 has its pivots 162 engaging grooved rods 166, and the initial length B_8 of the end B_7 of the toweling is attached in the already described manner to said wind-up roll 160, which engages the periphery of the subjacent draw roller 92. At the end of these operations, container A_3 is lifted by flexible teeth 32 engaging windows 30 to close the cover A_2, which entails the locking of latches 20-26-28 (Figure 7) of the lock D. In addition, the closing of cover A_2 engages the pairs of ribs 50-52 and 52-64 with the length of toweling B_5 and actuates the two sensing means 54-55 and 56-58.

In this position, the apparatus A is ready to function and make available to the user a length of toweling B comprising the loop B_6 which is continuously renewed. To renew a length of loop B_6, the user pulls the length B_5 of the loop B_6 downwardly, first to disengage rod 56 of the sensing means 56-58 from the pair of ribs 52-64 and successively rotate the draw roller 42 in the clockwise direction.

The rotation of the draw roller 42 is permitted as long as strut 68 is disengaged from stop catch 76; friction means 75 and action exerted by spring 62 on strut 68 actuate rod 66 which keeps in position and disengages said parts. The traction exerted on loop B_6 continues until one of the ribs 98, 104 engages tongue 100 of lever 72 to bring the strut 68 to the path of the catch 76, thus to stop the rotation of roller 42.

Only after the action on the length B_6 of the toweling ceases is the action of spring 62 again exerted on sensing means 56-58 such that rod 56 falls and bends toweling B to form a loop between a pair of ribs 52-64 while rod 56 disengages the strut 68 from catch 76, thus preparing the apparatus for a new operation.

The rotation of the roller 42 by the pull action of toweling B_6, in addition to actuating the kinetic chain relating to device F_1, which controls the winding up of the soiled toweling, also actuates device F_3 which pulls and winds up on roll B_1 the end of the toweling unwound from roll B_2.

Device F_3, as already said, comprises wheels 80, 82, 84, 90 which actuate either the draw roll 92 of the roll B_1 or the loading of coil spring 128. More particularly, the rotation of the cam 140 integral with shaft 94 of the planetary gear system 136-138 imparts a differential rotation between the roller 92 and sleeve 134 which holds the end 132 of spring 128, thus charging coil spring 128. This is because the cylinder 126 is prevented by pawl 116 held in engagement with teeth 124 from rotating from the position of rod 54 of the sensing means 54-55 uplifted from toweling B_5 sliding over the surface of the pair of ribs 50-52.

When the pull action on toweling B_6 is stopped, the previously described members retake their initial position to effect by a successive pull action a further operative cycle which entails the unwinding from roll B_2 and winding-up on roll B_1, whose wind-up roller 160 is lifted and moved along the guide groove 164. As a result of these movements, coil spring 128 is loaded to a maximum which is substantially reached when the toweling of the lower roll B_2 is exhausted. Also, if the maximum charge of spring 128 is reached

before such complete depletion, the function of the apparatus continues regularly in the described way, since the intervention of the friction means 130 provided between the cylinder 126 and the anchor end for spring 128 neutralizes the further charge of said coil spring 128.

When roll B_2 has exhausted its supply of toweling, the free end continuing its run toward roll B_1 in correspondence with the pair of ribs 50-51, does not any more hold up-lifted the rod 54 of the sensing means 54-55, which by the action of spring 120 swings conjointly with rocker 108 in the clockwise direction. The swinging of rocker 108 also in the counterclockwise direction, via rod 112, disengages the pawl 116 from teeth 124 of the cylinder 126. The cylinder by the action of the loaded spring 128 rotates in the counterclockwise direction (Fig. 6), and the said cylinder 126 by the operative communication of the unidirectional joint provided by the coil 150 and countersleeve 152 rotates the draw roller 92 in the counterclockwise direction, namely in the already-mentioned same direction.

The result is that the end B_6, B_7 of the exhausted toweling extends from cabinet A when the toweling from roll B_2 is exhausted. In addition, it is possible to control in a simple and expedient way the length of loop B_6 which from time to time extends from cabinet A to be available to the user, a stand 106 being shifted for engaging rod 104 in one of the holes 102 of the toothed wheel 96. There is also provided in a simple and safe way security from unauthorized tampering, also because the two parts A_2 and A_3 are held in their closed positions by one only lock D.

It is seen that the structure of the described and illustrated apparatus is simple and expedient, inasmuch as the different parts of the apparatus,

and particularly wheel system of devices F_1, F_2, and F_3 and cabinet A, can be made of pressed plastic materials. In such case, container A_3 can be of transparent material, thus to make visible the remaining supply of toweling of roll B_2. In addition, the draw rollers 42 and 92 provide their surfaces for engaging the toweling B formed expediently rough and rugged to ensure the adherence of the toweling and thereby the rotation of the rolls, even if the user draws loop B_6 in some unpredictable and unsymmetrical way relative to the width of toweling B.

The device of double sensing F_4 can be so constructed as to control the winding up and the unwinding of the toweling B from roll B_2 into roll B_1 via servo controls, thus to limit the force of pull exerted by the user on loop B_6 of the toweling; for example, rod 56 of the second sensing means 56-58 can actuate interrupting contacts of a feed circuit of a suitable motor which controls the action of roller 92 and loads coil spring 126, thereby to withdraw in cabinet A the end length of roll B_2.

Further modifications and changes can be provided in the apparatus to satisfy requirements from case to case. Such changes will remain within the scope of the claims and will belong to the range of the patent.

CLAIMS

1. Apparatus for controlling the unwinding and winding up of rolls of toweling or the like, unwound by the pull action exerted by the user on a renewable loop of predetermined length, controlled by sensing means for said toweling, characterized by an accumulator of energy (128) connected via unidirectional coupling means (150, 152) to winding-up means (92, 160) for the soiled toweling (B_7), and members (80, 82, 94, 136, 140) for its reloading, said means being actuated by control means (42) controlled by the pull or tension exerted by the user on the loop (B_6) of toweling extending outside a cabinet (A) of said apparatus, blocking means (116, 124) to hold in charged condition said accumulator of energy, said blocking means being controlled by sensing means (50, 54, 56, 64) of the toweling, said sensing means being disposed adjacent the starting portion (B_5) of said loop so that the unwinding of the roll of toweling (B_2) charges the accumulator of energy (128), while when said sensing means detect the absence of toweling, they actuate the blocking means (116, 124) of the accumulator of energy to permit said blocking means, via unidirectional clutch means (150, 152) to actuate the winding-up means (92, 168) of the toweling.

2. The apparatus according to claim 1, characterized by at least one coil spring (128) disposed in a cylinder (126) and having one end (130) of said spring attached to said cylinder and the other (132), via unidirectional clutch means (150, 152), to an outlet (140) of a speed-reducing group (136, 138, 140) ending in control means (42) to ensure the rotation of the toweling winding-up means (92, 160).

3. The apparatus according to claims 1 and 2, characterized by adjusted torsional coupling means (130) interposed between the outer end of the coil spring (128) and the circumferential wall of cylinder

(126) to interrupt said torsional coupling when the spring load has reached the stabilized limit.

4. The apparatus according to claims 2 and 3, characterized by a ratchet gear (116, 124) having saw teeth (124) on the circumference of the cylinder (126) in association with the coil spring (128), while spring-biased pawl (116) operatively communicates with a first sensor (50-52-54) of sensing means (50-54-56-64) of the toweling, a spring-biased rocker (108, 110) being interposed between the movable part (54) of said sensor and the pawl of the pawl means (116, 124).

5. The apparatus according to claims 2 to 4, characterized by a sleeve (124) to hold anchored the inner end (132) of the coil spring (126) and joined to the outlet wheel (136) of an epicyclic reducer, the inlet wheel (140) of said reducer being operatively connected to winding-up means (92, 160) of the toweling (B).

6. The apparatus according to claims 2 to5, characterized in that the sleeve (134) which holds anchored the coil spring (128) is supported in a pivot coaxial with a wind-up roll (92) of the toweling and torsionally communicates with the latter via a directional joint constituted by a coil spring (150) coaxially cooperating with the periphery of said pivot and whose one end (154) is anchored in cylinder (126) of the coil spring (128) to stabilize operative torsional communication between the loaded coil spring and wind-up means (92, 160) of the toweling when the pawl means (116, 124) is deactivated.

7. The apparatus according to claims 1 to 6 characterized by a first sensor (50-52-54) and by a second sensor (52-64-56) of sensing means (50-54-56-64) successively disposed to control the unwinding of toweling (B), spring-biased means (62) acting on said sensor to bend and anchor between supports (52-64) a length of

toweling B_5 slidingly cooperating with the movable part (56) of the second sensor (52-54-56) and holding under tension said length of toweling B_5 between supports (50-52) of the first sensor (50-52-54) contrary to the bias of spring-loaded means (120) acting on the movable part (54) of said first sensor, said movable part (56) of the second sensor being actuated by the user when he pulls loop B_6 of the toweling.

8. The apparatus according to claims 1 to 7, possibly in combination with one or more of claims 2 to 6, characterized by a draw roller (42), the periphery of said roller being wound and operatively engaging, with the aid of at least one spring-biased roll (40), the length of toweling B_4 unwinding from roll B_2 and whose free end B_5 is conveyed and caused to pass between the sensing means (50-54-66-64) provided adjacent the exit opening (34, 35) for the toweling, a reducing set of wheels (80-82-95-96) actuated by said draw roller and associated with the blocking members (48, 68, 100), which control and stop the rotation of said roller, to control and from time to time remove a length of toweling B_5 which constitutes the loop for the user.

9. The apparatus according to claim 8, characterized by an arrest catch actuated by the draw roller (42) and adapted to be engaged by a swinging blocking means (68, 72) comprising a strut (68) in which is fulcrumed a lever (72) flexibly connected to the first of spring-biased means (74), said swinging means (68, 72) being braked in their displacements by the braking means (75) interposed between said group and corresponding support means E_1 and alternately actuated on one side by a plurality of projections (104) in an exit wheel of the reducing wheel means (80-96) and, on the other side, by a spring-biased tongue (65) joined to movable set (56) of the second sensor (52, 64,

56) such that on said swinging means being actuated by one of the projections (104), the strut (68) is shifted into the path of the arrest catch (75), whereby to stop the rotation of the draw roller (42) relative to the renewal of the loop run (B_6).

10. The apparatus according to claims 8 and 9, characterized by a plurality of rods (98, 104) provided on the periphery of the exit wheel (96), a part of said rods (104) is supported by a stand (106) and engages holes (102) provided in the exit wheel, thereby to control the length of the toweling B_5 renewed from time to time.

11. The apparatus according to claims 1 to 7, characterized by a wind-up roll (106) provided either with anchoring and support means (165) for the initial end B_8 of the toweling coming from unwinding roll B_2 or with end pivots (162) slidably engageable in substantially vertical grooves (164) equipped in the longitudinal direction with bars (166) supported on opposed walls (E_1, E_2) of a support frame E of said apparatus, said wind-up roll being rotated by friction with a subjacent draw roller (92) supported by said opposed walls and connected to the first draw roller (42) via a suitable kinetic chain (80-82-95-96).

12. The apparatus according to claim 11, characterized by the fact that the grooved bars (166) upwardly end in said concave tongue (68) adapted to accommodate and support pivots (164) of the wind-up roller (B_1) to maintain said roller uplifted and disengaged from said grooves (164) in said bars, said concave tongues (168) being disposed above said inclined guide tongues (16), provided in the upper edges of said opposed parallel walls (E_1, E_2) to permit the rolling-up and the removal of the wound-up roll B_1 from cabinet (A).

13. The apparatus according to claim 1, pos-

sibly in combination with one or more of claims 2 and 12, characterized by the fact that the cabinet (A) comprises at least three gears (A_1, A_2, A_3) stationarily interconnected, the first of said members A_1 is a base plate and hingedly supports the second member or cover (A_2) amd stationarily supports the support frame (E) with various members of the apparatus disposed - at least in part - in said cabinet, said base frame downwardly having two parallel apertures (34-35, 156-158), through the first of which (34-35), a length of toweling (B_5) coming from the unwind roller (B_2) passing through the first of said apertures and forming the outer loop (B_6), the other end (B_7) of said loop is threaded through the second aperture (156-158) to then pass to the inside of the cabinet and to wind up on the wind-up roller (B_1).

14. The apparatus according to claim 13, characterized by an overturnable container (A_3) for the unwind roll (B_2), downwardly supported by the base plate (A_1) via a cross-piece (14) provided at the rear edge of said container, guide bars (16) connected to said base plate and spaced from each other to permit the free passage of toweling (B) and to support slidably hingedly the ends of said cross-piece, coupling and joining members (30, 32) disposed between the free ends of said guide bars and the front wall of said overturnable container, either to hold said container in the uplifted position or to permit the unwinding from roll (B_2) of toweling (B_4) to wind up and operatively engage the draw roller which actuates various devices (F_1, F_2, F_3) held in the support frame (E).

15. The apparatus according to claims 13 and 14, characterized by flexible teeth (32) at the ends of the guide bar (16), stationarily engaging the edges of molded apertures (30) provided adjacent the

upper edge of the front wall of the overturnable container.

16. The apparatus according to claim 13, possibly in combination with one or more of claims 14 and 15, characterized by the fact that the cover (A_2) of the cabinet is joined by hinge (12) to the upper edge of the base plate (A_1), the lower end (34) of the said cover downwardly extends beyond the molded apertures (30), goes beyond and covers the molded apertures (30) of the front wall of the over-turnable container (A_3) when the container is in the up-lifted position, said lower end being conveniently spaced from said front wall to define with said wall the aperture (34, 35) for the exiting of the toweling, which forms the loop (B_6) for the user.

17. The apparatus according to claim 13, possibly with one or more of claims 14 and 16, characterized by the fact that the opposed walls (E_1, E_2) of the supporting frame (E) hold the supports (164, 166) for the wind-up roll (B_1) and outside said walls hold the devices (F_1, F_2, F_3) which control the winding up of the toweling, the length of the loop (B_6) for the user, and which withdraw inside the apparatus the end (B_8) of the toweling being wound up, detachable connecting members (E_3, E_4) are provided for stationarily connecting said frame (E) to the base plate (A_1) thereby to permit the removal of said frame from the base plate to control and regulate said devices.

18. The apparatus according to claims 13 and 17, characterized by locking tongues (33) at the lower edge (34) of cover (A_2) of the base plate, said tongues engaging the lower areas of the molded apertures (30) of said front wall and being upwardly limited by ridges of flexible teeth (32) of guide bars (16), thereby to stationarily block between them different parts and ensure the closing of the cabinet (A).

19. The apparatus according to claim 18, characterized by the fact that the overturnable container (B_3) provides in its vertical median portion a lug (38) for the passage of the final length (B_7) of the outer loop (B_6), said length being conveyed toward the wind-up roller (160) by means of at least two guide bars (156, 158) on the base plate and on the rear wall of said overturnable container.

20. The apparatus according to any of claims 13 to 19, characterized by arrest teeth (28) forwardly presented by base plate (A_1) and adapted to be engaged by spring-biased pawls (20) jointed to a control arm (22) rotatably supported inside cover (A_3) of the cabinet and communicating, at least at one of its ends, with control means (D), said members being actuated by the user to lock to the base plate the overturnable container (A_3) and the said cover (A_2).

21. The apparatus according to any of claims 1 to 20, characterized by the embodiment shown in the accompanying drawings, substantially as described and adapted for the described applications.

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FIG.1

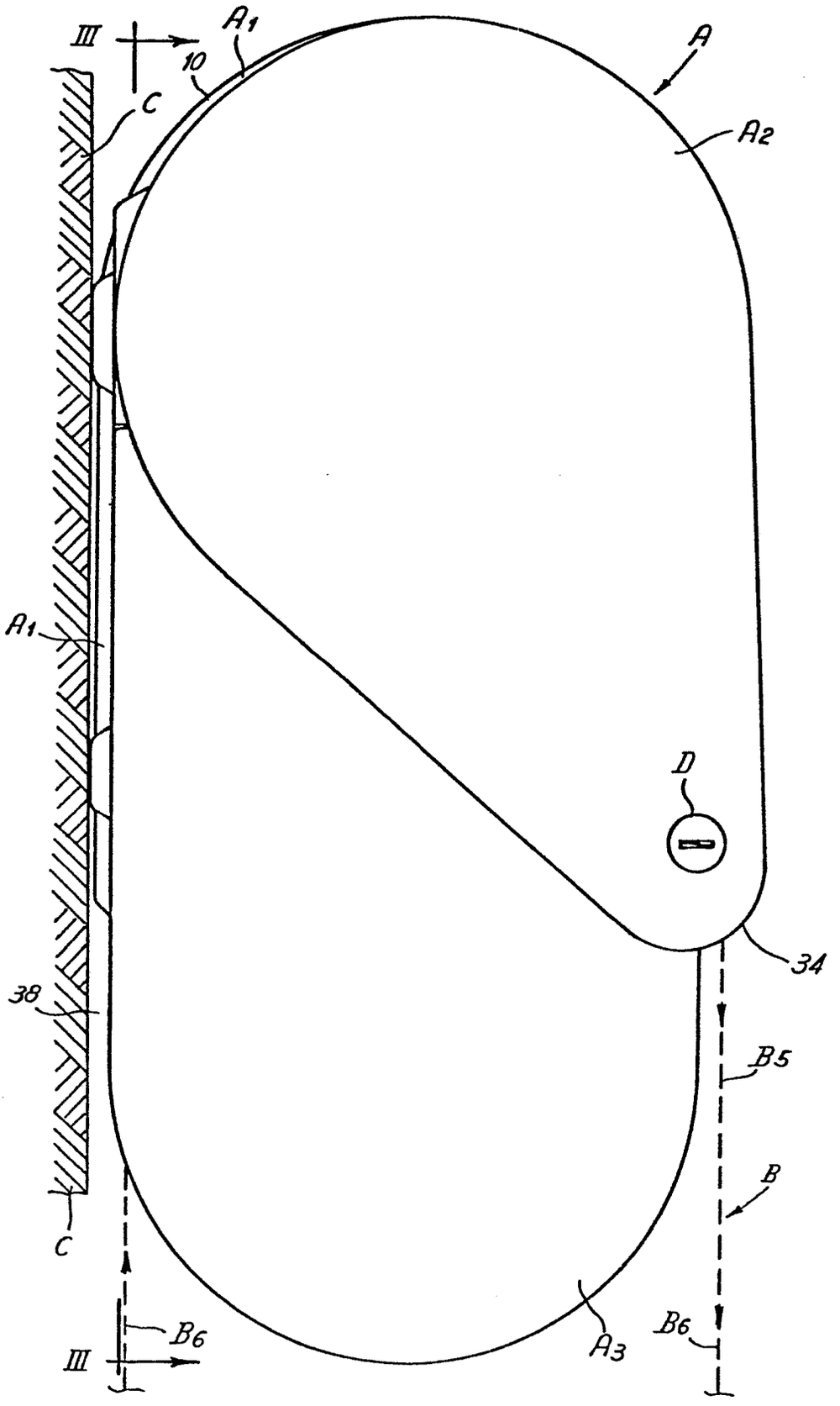
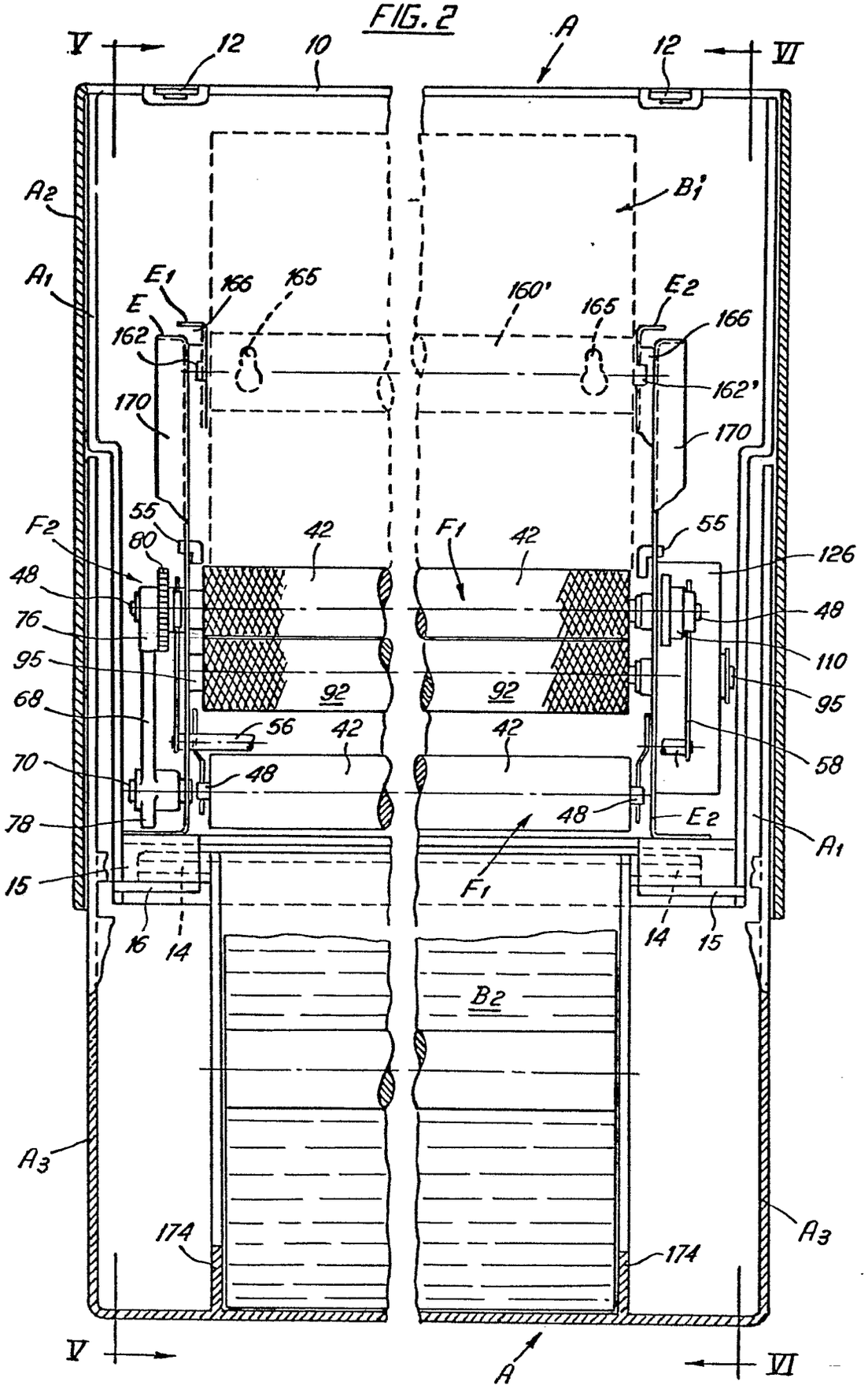


FIG. 2


V
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A
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VI
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FIG. 3

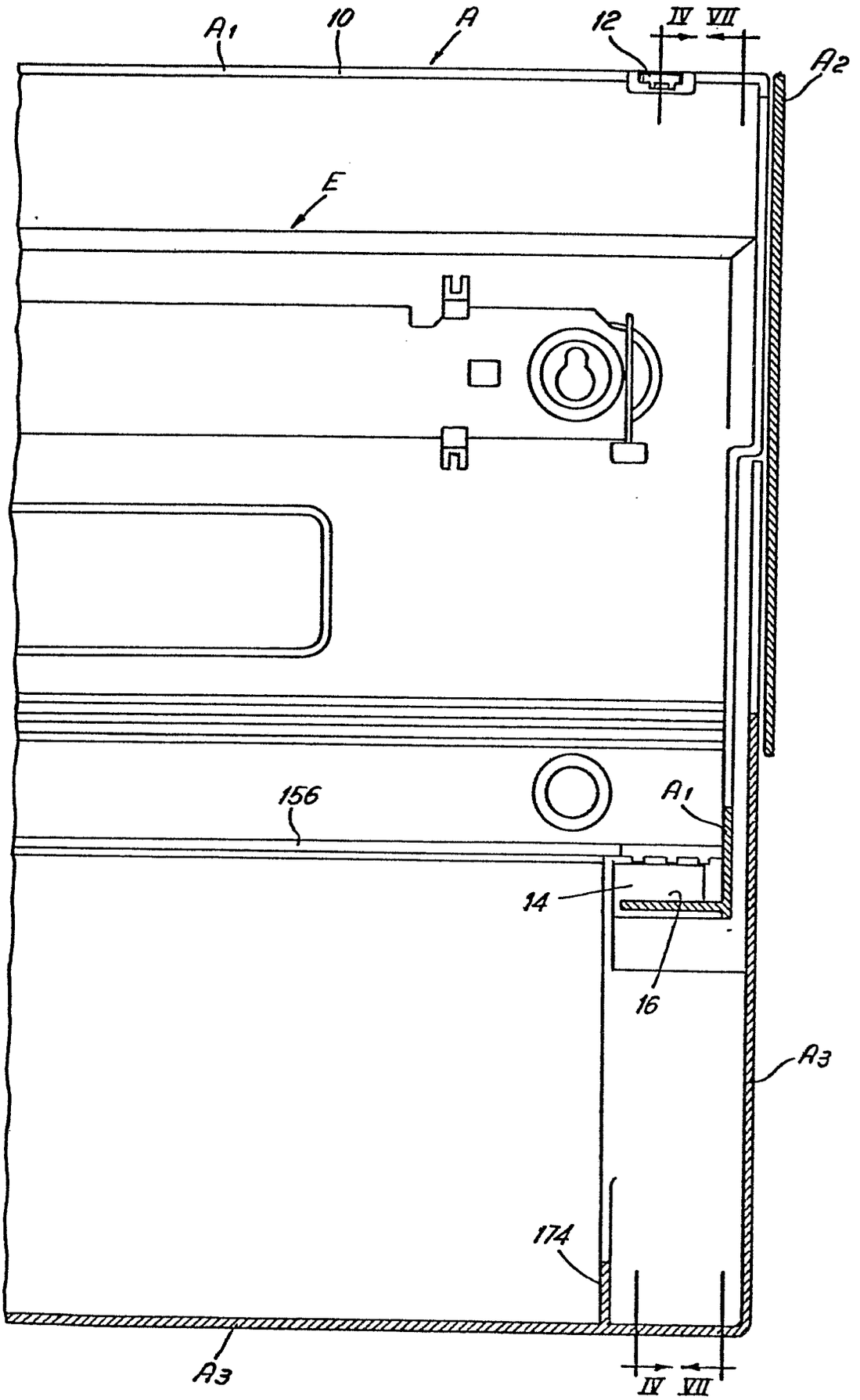

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FIG. 4

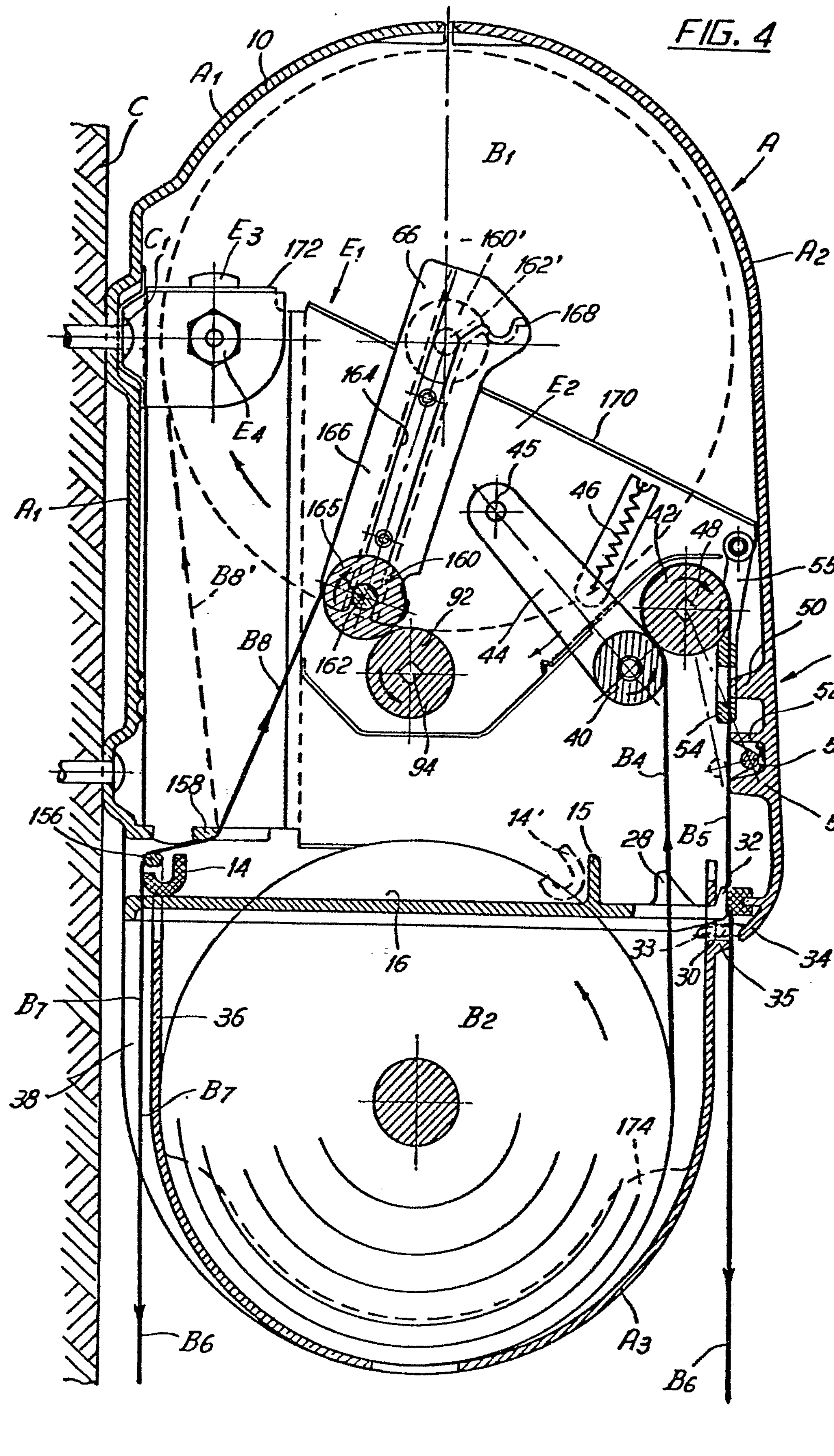
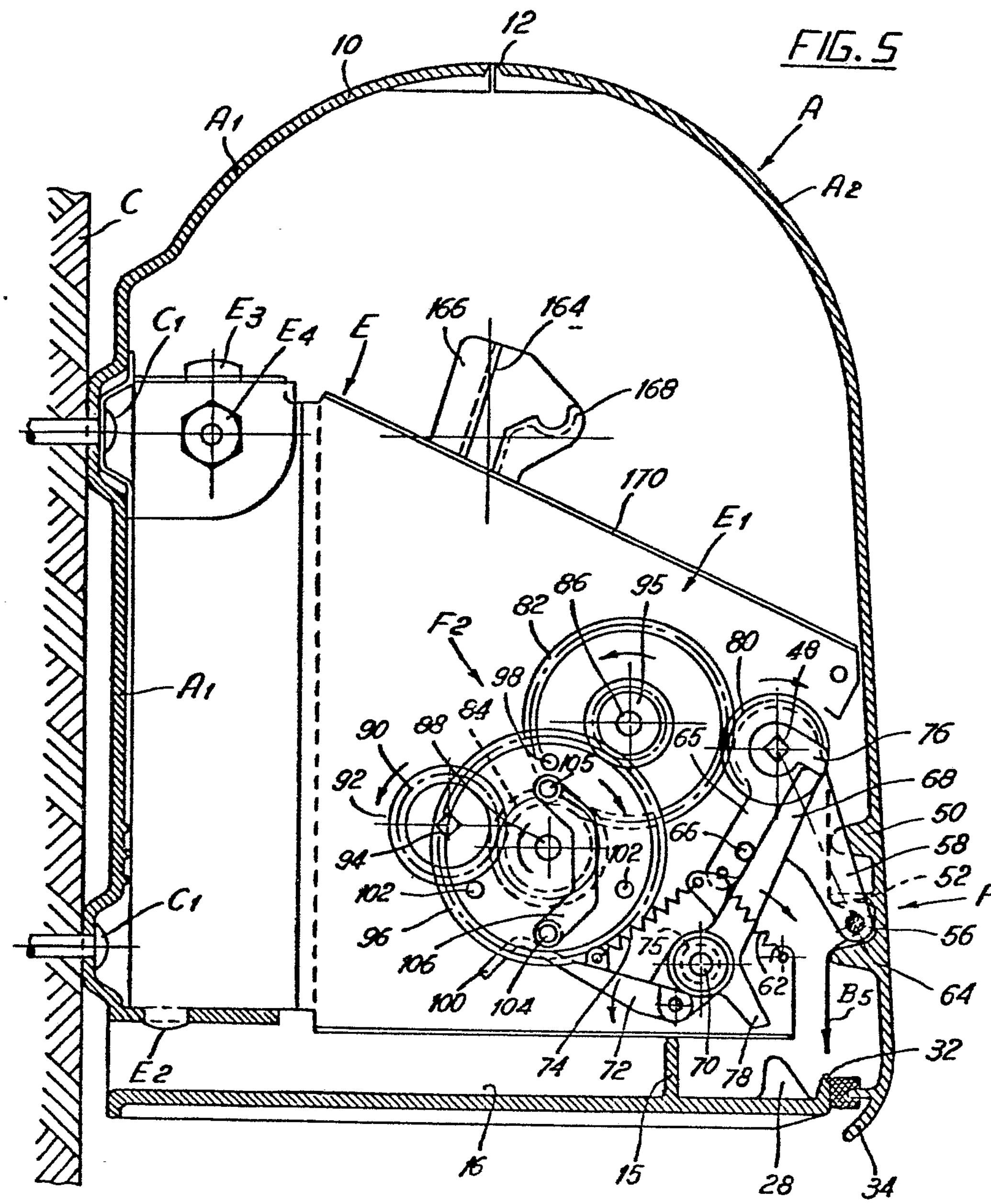


FIG. 5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12
A1
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C1
E3
E4
E
166
164
168
170
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86
95
80
48
98
84
90
88
105
65
76
68
92
94
102
66
50
58
52
F4
56
96
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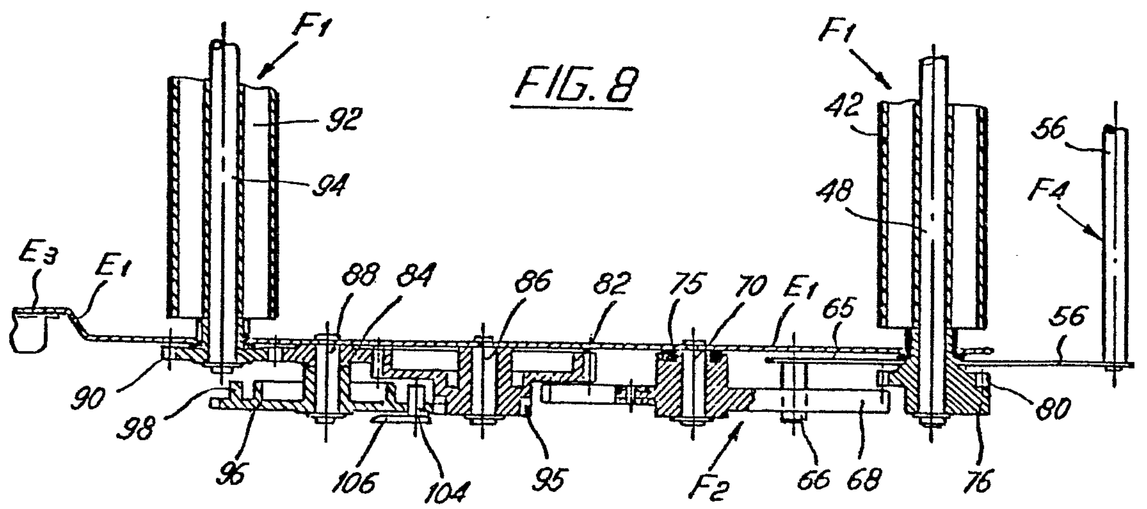
28
34

FIG. 8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F4
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104
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F2
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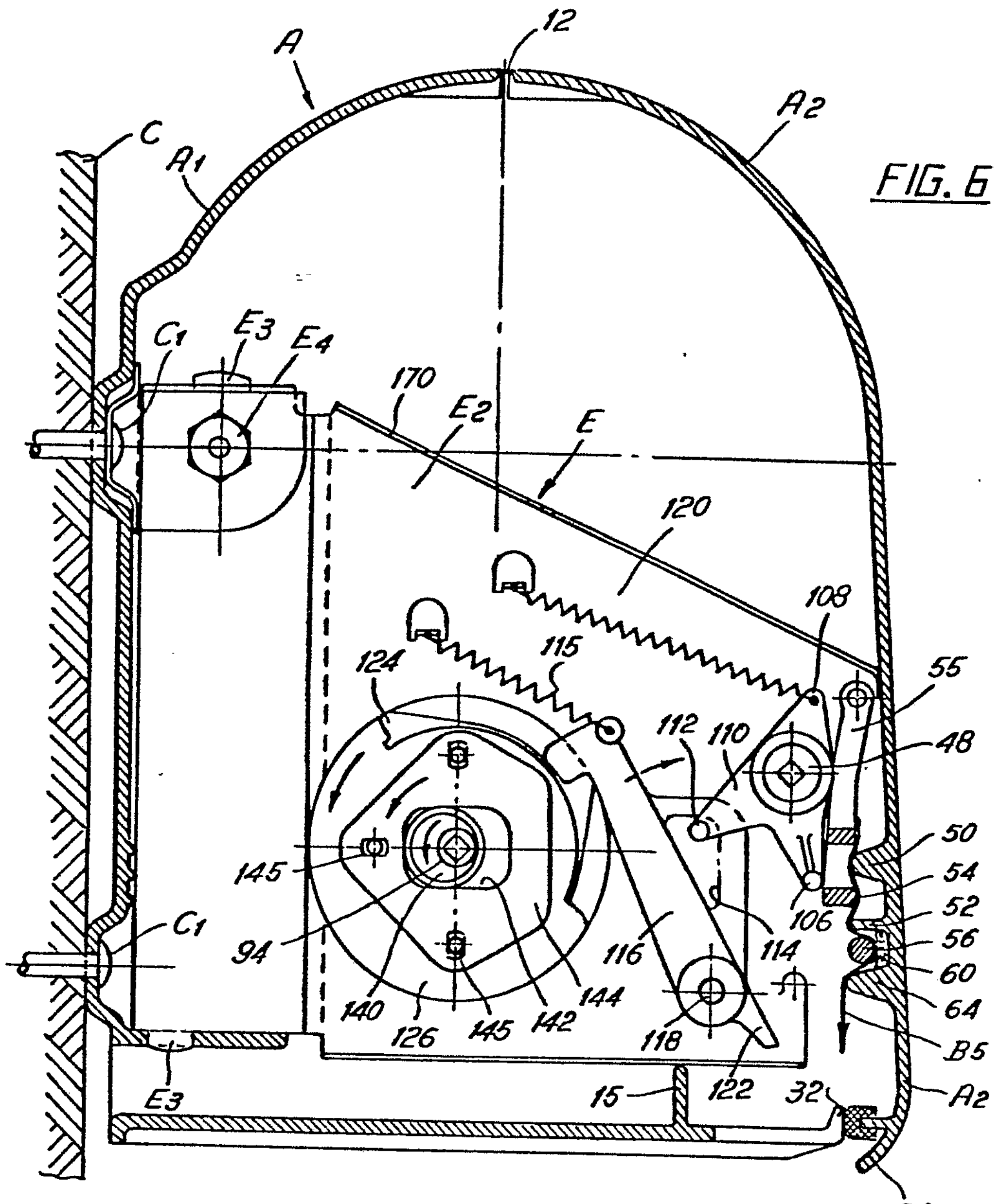
76
80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C
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C1
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50
54
52
56
60
64
B5
A2
145
94
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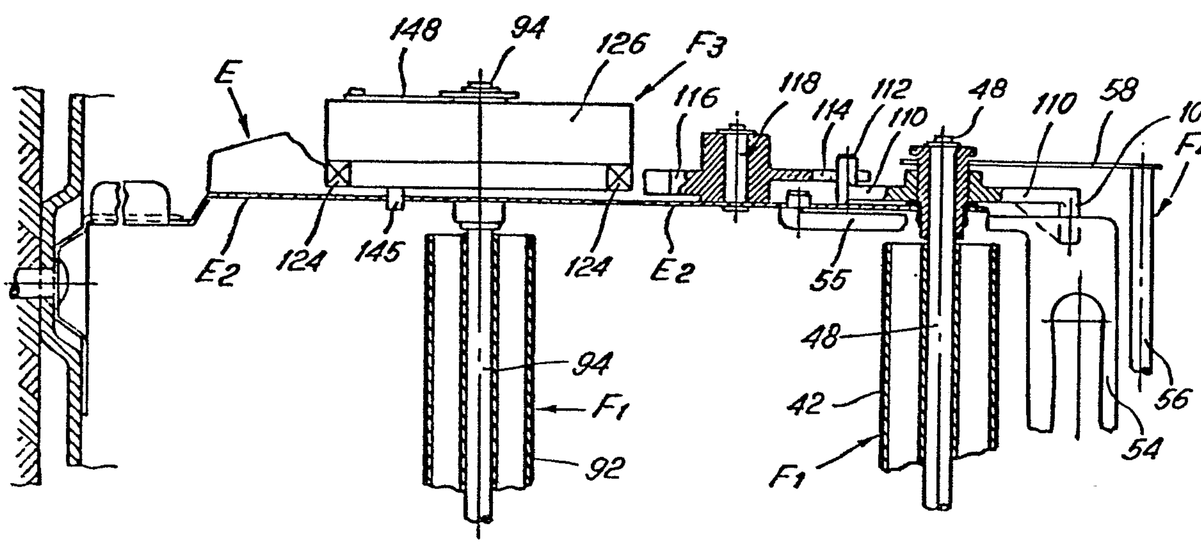
114
106
118
122
C1
E3
15
32
34

FIG. 6

FIG. 9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94
126
F3
E
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114
112
110
48
110
58
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F4
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124
145
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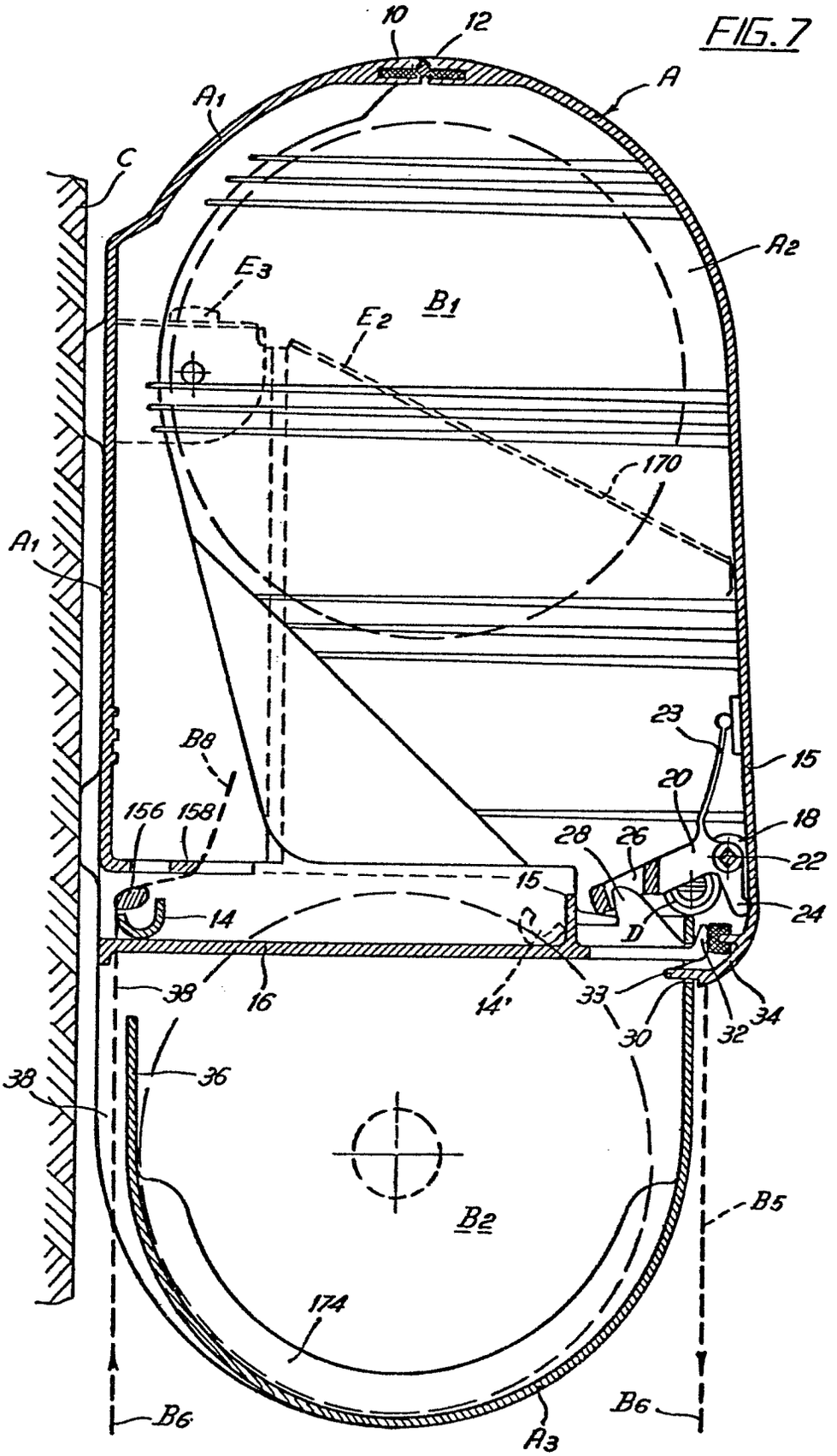
E2
55
48
94
F1
92
42
F1
56
54

FIG. 7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C
A2
E3
B1
E2
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B8
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156
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26
22
15
14
D
24
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16
14'
33
30
32
34
38
36
B2
B5
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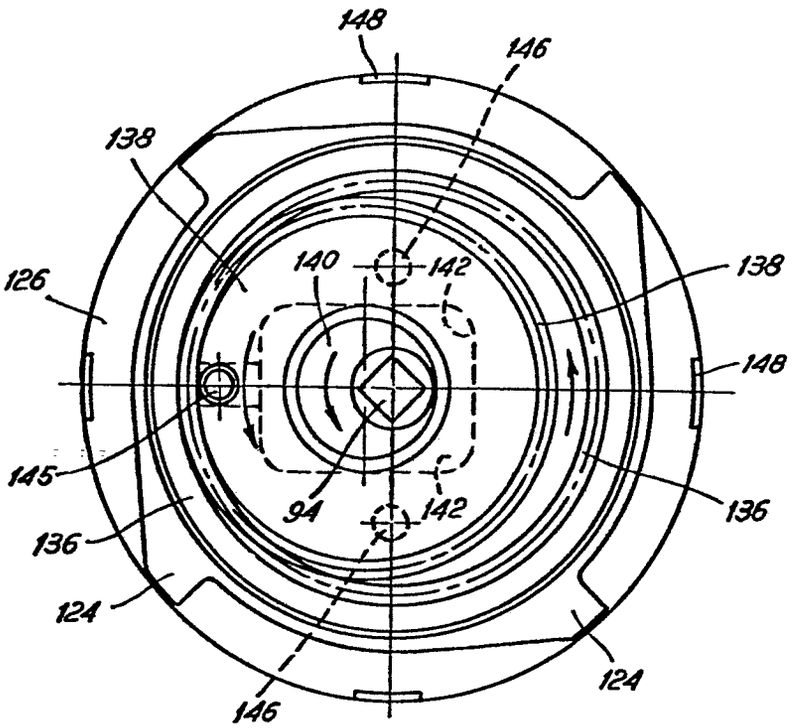
B6
B6
A3

FIG. 10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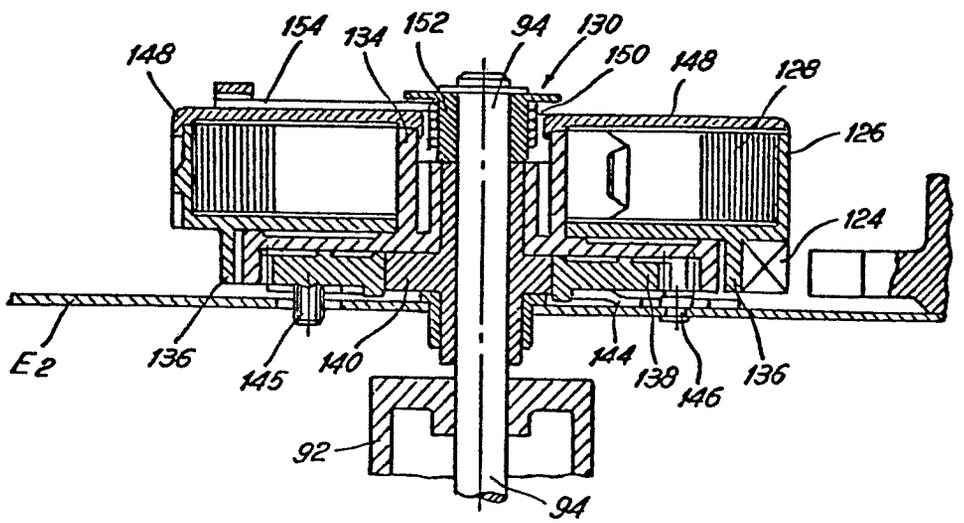
146

FIG. 11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E2
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92
94