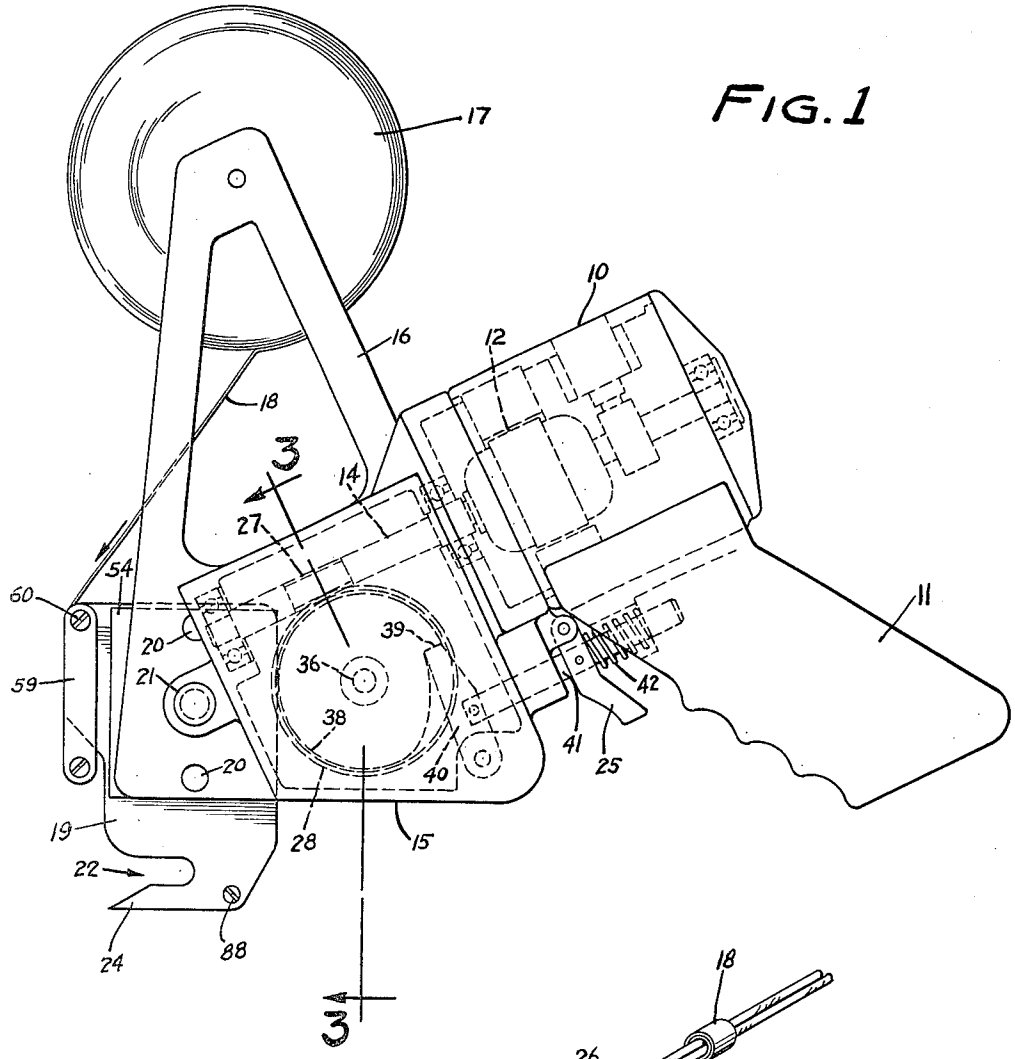
April 12, 1966 P. F. AURICH ETAL 3,245,860

HAND TAPER

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FIG. 1



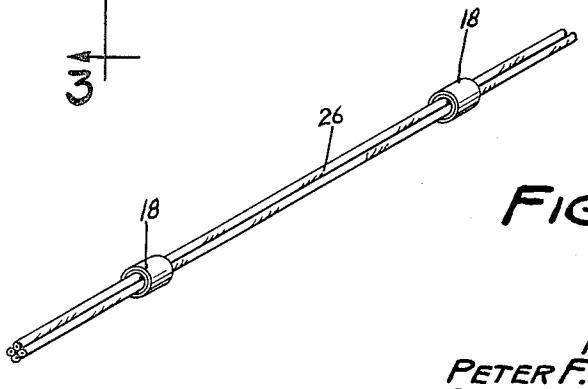


FIG. 2

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HAND TAPER

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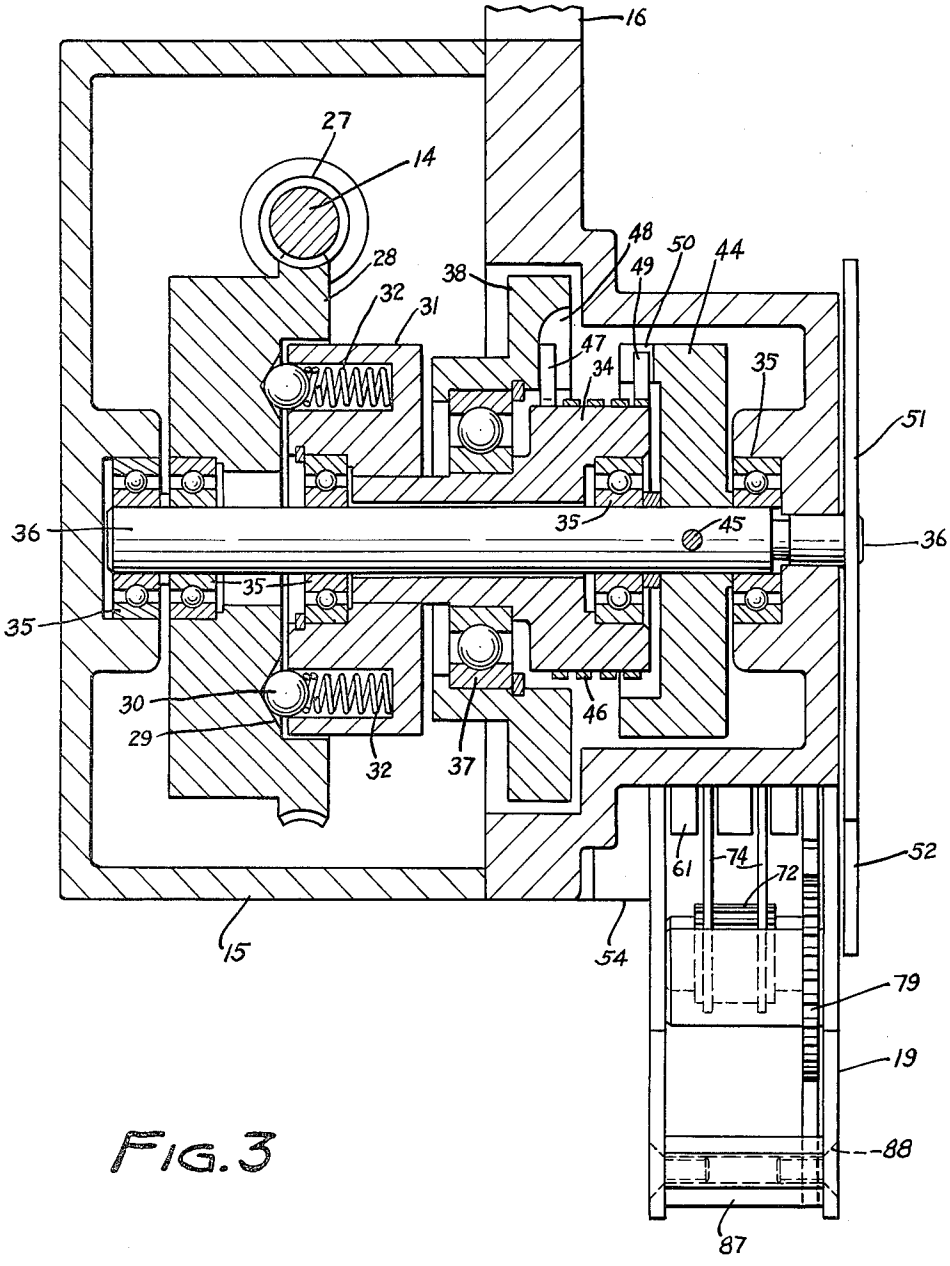


FIG. 3

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FIG. 4

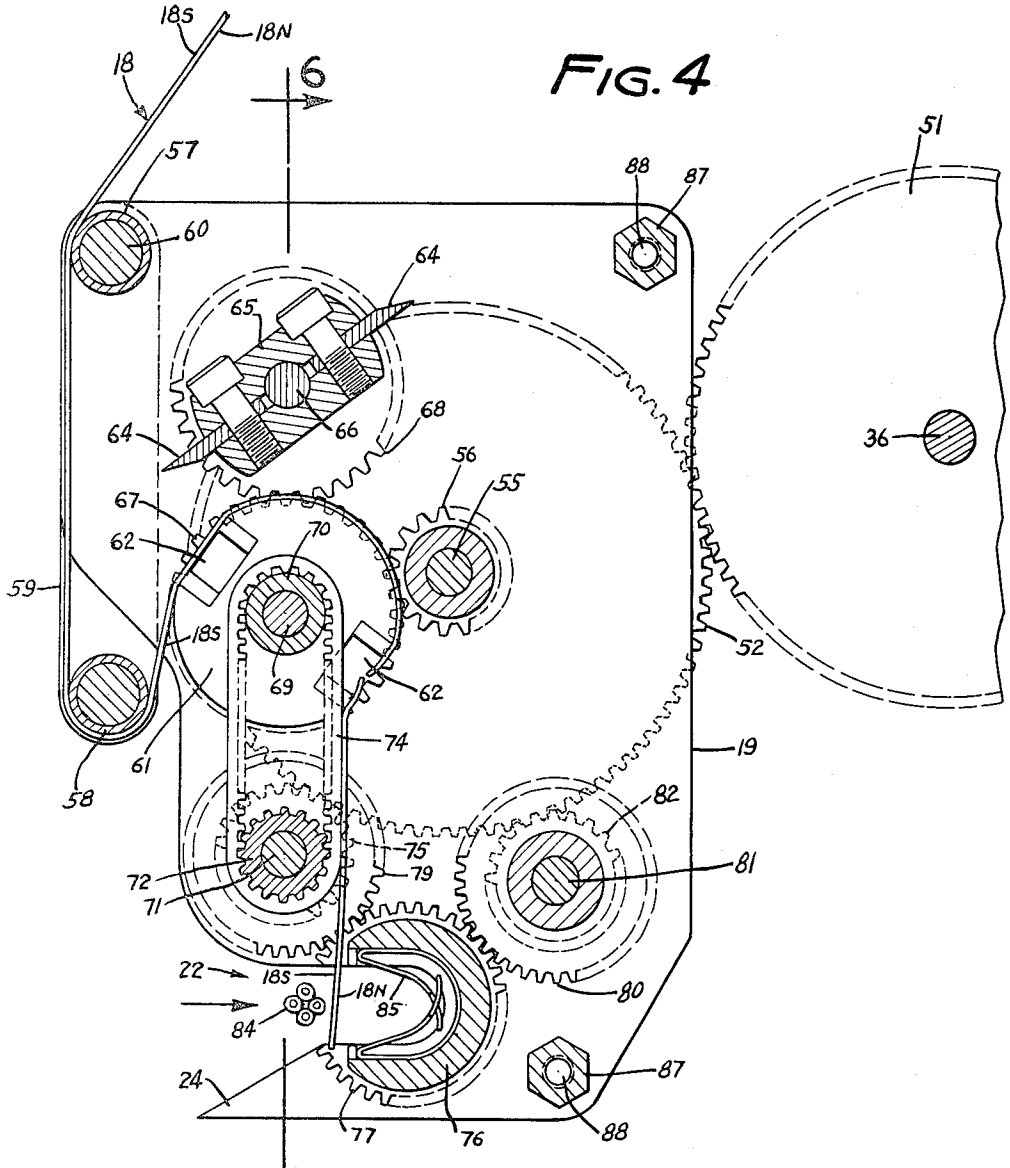
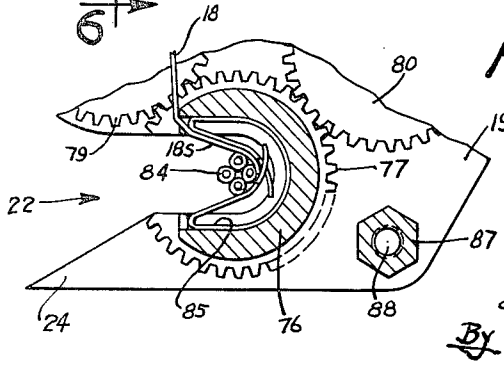


FIG. 5



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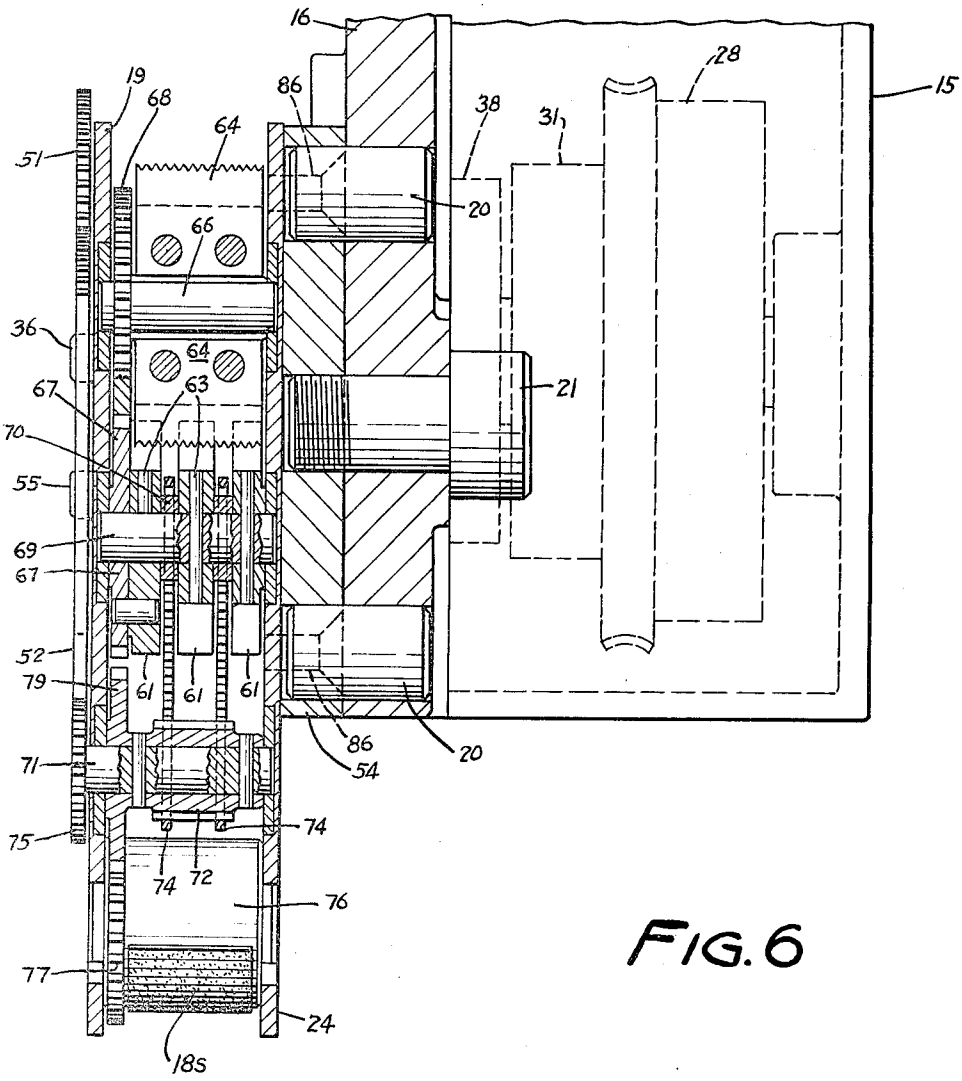


FIG. 6

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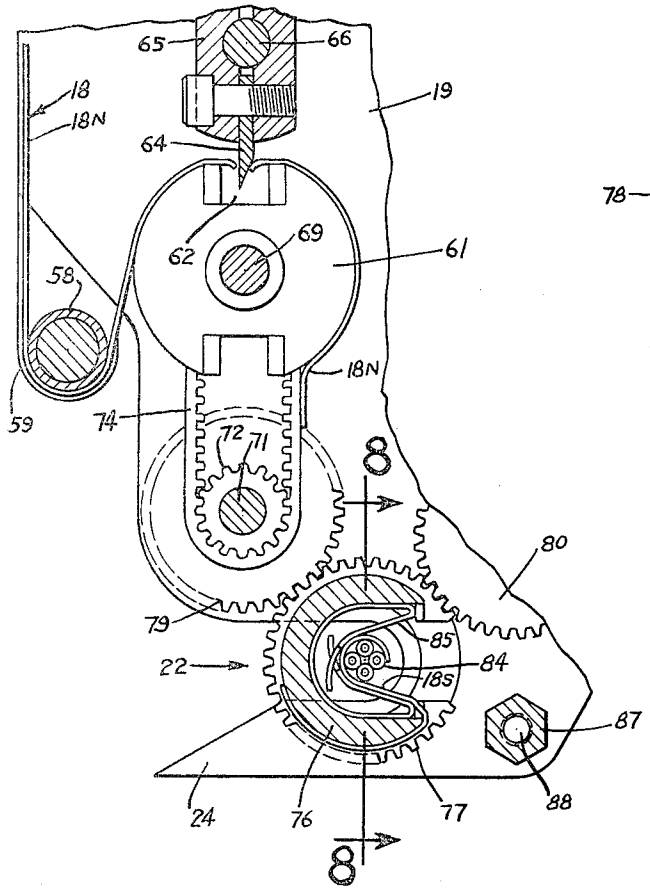


FIG. 7

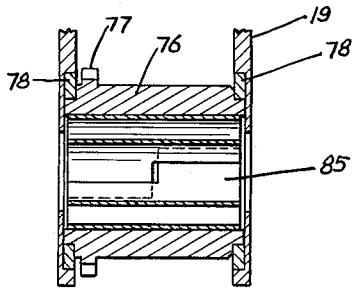


FIG. 8

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United States Patent Office 3,245,860 Patented Apr. 12, 1966

3,245,860

HAND TAPER

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Filed July 5, 1961, Ser. No. 121,953
10 Claims. (Cl. 156—486)

This invention is a novel tape applying machine which employs a novel drive mechanism.

The taping cartridge is novel in its extreme simplicity and compactness which makes it possible to incorporate the entire mechanism in a hand supported device that can be taken to the objects to be taped rather than necessitating bringing the objects to be taped to the taping machine. This compactness is achieved at least in part by having the tape feeding, cutting, releasing and applying mechanism all synchronized and driven by the same driving source so that only one source of power is necessary for the entire mechanism. Another novel feature of the taping cartridge includes having the tape releasing mechanism intersect and operate from below the tape engaging surface of the tape feeding mechanism. Yet another novel feature of the device is using an endless belt as the tape releasing structure which also act as a tape guiding means. The tape applying structure is a C-shaped member that is driven in a rotary pattern together with tape pressing structure contained within the C-shaped tape applying means.

The driving mechanism is believed novel in the combination of a torque limiting structure with a single revolution driving clutch arrangement. This is a combination in tandem of an overload clutch and a cam controlled spring gripping driving control clutch.

Accordingly, it is the principal object of this invention to provide a novel taper.

It is a further object of this invention to provide a novel taper which incorporates a single power mechanism to operate all of the steps involved in metering cutting and applying tape.

A still further object of this invention is to provide a taper in which the power mechanism is both controlled as to the amount of torque applied to the mechanism and in the distance that it drives at any one impulse of the controlling structure.

It is a still further object of this invention to provide a taper that incorporates tape releasing mechanism which actually intersects and operates from beneath the surface of the tape driving or feeding means.

A still further object of this invention is to provide a taper in which the tape feeding, cutting, releasing and applying structures are all rotary and synchronized as to be constantly related to each other in a fixed pattern.

It is a still further object of this invention to provide a taper in which the tape releasing mechanism by reason of its being in the form of endless belts or bands may serve also as a tape guiding structure.

Other and further objects of the invention are those inherent and apparent in the apparatus as described, pictured and claimed.

To the accomplishment of the foregoing and related ends, this invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principles of the invention may be employed.

The invention will be described with reference to the

drawings in which corresponding numerals refer to the same parts and in which:

FIGURE 1 is a side elevation of the entire device with hidden elements illustrated with broken lines;

FIGURE 2 is an isometric illustration of wires that have been taped with the mechanism of the invention;

FIGURE 3 is a sectional view of the driving mechanism taken on the line 3—3 of FIGURE 1 but drawn to a substantially larger scale than FIGURE 1;

FIGURE 4 is a vertical section of the taping cartridge taken on the line 4—4 of FIGURE 3; the scale is that of FIGURE 3, and broken lines illustrate hidden parts;

FIGURE 5 is a fragmentary representation of the tape applying means with the object shown in FIGURE 4 having been advanced into the tape applying means in order to have tape applied thereto; the scale is that of FIGURE 3;

FIGURE 6 is a vertical section taken at right angles to the vertical section of FIGURE 4 and taken on the line 6—6 of FIGURE 4 but with the mechanism positioned as illustrated in FIGURE 7; broken lines illustrate hidden parts; the scale is that of FIGURE 3;

FIGURE 7 is a fragmentary view of a portion of the mechanism illustrated in FIGURE 4 and drawn to that scale but having been driven to a different relative position of the parts; and

FIGURE 8 is a section taken on the line 8—8 of FIGURE 7.

Turning first to FIGURE 1 of the drawings, a conventional motor **10** supplied with an ordinary pistol grip **11** provides both motive power and one means of supporting the device when in use. The armature **12** of motor **10** is connected to a motor shaft **14** which extends into the housing **15** of the drive mechanism of the device. The arrangement of the entire drive mechanism will be discussed in detail in connection with FIGURE 3.

Housing **15** also provides a means for attaching the bracket **16** thereto which is a suitable means for supporting in operable position a roll of tape **17** from which a single layer of tape **18** may be withdrawn and directed into the taping cartridge **19**. The taping cartridge is also secured to the housing by suitable means that permits it to be released therefrom. A suitable manner of doing this is seen in FIGURE 1 where the dowel pins **20** position the cartridge with respect to housing **15** and the screw **21** holds the cartridge and the dowel pins in close association with each other so that the dowel pins may effectively determine the relative positions of the cartridge and housing **15**.

At **22** is seen the entrance to the tape applying portion of the device and the lower faces of a frame of cartridge **19** adjacent to the opening **22** may be pointed as at **24** in order to make it possible to slip it easily under wires or other objects to be taped. Operation of the tape feeding and applying mechanism is controlled by a trigger **25** which is positioned traditionally with respect to the pistol grip **11**. The method of operation of the device is to have motor **10** rotating constantly when the device is intended to be used and to use trigger **25** to control the starting and stopping of the tape metering and applying structure.

In FIGURE 2 a bundle of wires **26** may be seen to have had bands of tape **18** applied thereto in order to hold them together as in a wiring harness, for example.

Turning now to FIGURE 3, the housing **15** is seen to be made up of two parts that are secured together conventionally hence neither shown nor described. One part of housing **15** may be formed integrally with the bracket **16**, a fragment of which appears at the top of FIGURE 3. Inside the housing, motor shaft **14** is provided with

a worm 27 which engages a suitable combination worm gear overload clutch portion 28. The overload clutch portion has on its face a groove 29 within which are detents that receive the balls 30 in order to provide a driving connection between the portion 28 of the overload clutch and the cooperating portion 31 of the same clutch. Each of the balls 29 has a spring 32 behind it which urges it in the direction of portion of the overload clutch that is combined with worm gear 28.

As long as the torque applied by the shaft 14 does not have to exceed a given value in order to rotate portion 31 of the overload clutch, the two portions of the clutch revolve together. If torque values exceed the setting of the clutch, the balls are forced out of the detents and the springs yield to allow this to happen. Balls 30 will continue to rotate in the groove 29 of clutch portion 28 until such time that torque values again fall below the set figure in which case the balls again settle into the detents in the portion 28 of the overload clutch. At this time the two portions of the clutch are again driven simultaneously.

Clutch portion 31 may be formed integrally or, as shown here, rigidly secured to a driving drum member 34. The portions of the overload clutch and the driving drum are suitably journalled within the housing 15. Here they are shown as being supported by suitable bearings 35 which engage with their inner races a shaft 36 that in turn is journalled within the housing 15 by bearings like those supporting the overload clutch and the driving drum and hence also numbered 35.

A bearing 37 supports a stop plate of cam configuration 38 which includes, as shown in FIGURE 1, the cam lobe 39. The stop plate or cam stop 38 is controlled in whether it is allowed to rotate or not, as shown in FIGURE 1, by a dog 40 which in turn is linked as at 41 to trigger 25. When trigger 25 is in the position shown in FIGURE 1, the cam or stop plate 38 can not rotate. When trigger 25 is drawn toward the pistol grip 11, however, cam plate 38 is free to rotate. In normal operation, trigger 25 is depressed long enough to release the cam 38 and is immediately released. Pressure on the trigger causes dog 40 to move away from the lobe 39 long enough for the cam plate 38 to start revolving. When the trigger is released, cam 39 is riding on the outside of the cam plate 38 beyond lobe 39 and is held in yielding contact by any suitable means such as spring 42. When lobe 39 again returns to the dog 40, the cam plate 38 is stopped again. Thus, a means is provided for allowing cam plate 38 to revolve freely when desired, and to start revolving but to be stopped after a single revolution, when desired.

At 44 in FIGURE 3, is seen what is referred to as the shaft plate. This plate is suitably fixed to shaft 36 as by pin 45. A drive spring 46 encircles the drive drum 34 and has its two ends arranged to be engaged in slots in the cam plate 38 and the shaft plate 44. This structure is seen clearly in FIGURE 3 where end 47 of spring 46 is engaged in slot 48 of the cam plate 38 and end 49 of the spring 46 is engaged in the slot 50 of the shaft plate 44. The operation of this mechanism is as follows.

Whenever trigger 25 is pulled in order to withdraw dog 40 from cam lobe 39, the cam plate 38 is free to rotate. For this reason the spring 46 is not prevented from tightening on the drum 34. As end 49 of the spring 46 is held in the slot 50 of the shaft plate 44, the friction of the spring against the drum 34 tends to cause it to tighten about the drum and grip it securely. Under these circumstances, the shaft plate 44 is driven by the drum 34 until such time as any load applied to the shaft causes the overload clutch 28–31 to release or until such time as the lobe 39 of cam plate 38 engages again the dog 40. When the latter happens, the end 47 of spring 46 is suddenly stopped. Spring 46 is wound about the drum 34 in such a manner that when the end 47 of the spring 46 is held in a stationary position, the friction of drum 34 with respect to spring 46 tends to unwrap the spring. The spring reacts by yielding slightly in an outward direction as though it were beginning to be straightened, and in so doing, the grip of the spring 46 is released from the drum 34. At this point, rotation of shaft plate 44 ceases (although drum 34 continues to rotate) and shaft 36 remains stationary until dog 40 is again released from lobe 39 of the cam plate 38.

On its end nearest to shaft plate 44, shaft 36 extends outside of housing 15 and has appropriately secured thereto a gear 51 which meshes with a gear 52 that is secured to the central driven shaft of the taping cartridge 19. Whenever shaft 36 is rotated, therefore, gear 51 (driving gear 52) actuates the taping mechanism. Whenever shaft 36 is held stationary, the taping mechanism likewise is stationary.

As shown in FIGURE 3, cartridge 19 is somewhat narrower than the space between the housing 15 and gear 52 and hence a spacer block 54 is inserted between them in order to make a solid connection between the cartridge and the housing while maintaining the alignment of gears 51 and 52. This arrangement allows for some variation in cartridge width and also provides sufficient thickness for dowel pins 20 and screw 21 to operate successfully. Spacer block 54 may also be seen in fragment in FIGURE 1.

In FIGURE 4 the cartridge 19 is shown in section together with a fragment of gear 51 and shaft 36. Gear 52 is journalled on frame 19 by any suitable means such as the shaft 55. A smaller gear 56 is also secured to the shaft for simultaneous rotation with gear 52.

At the left in FIGURE 4 may be seen a pair of rollers 57 and 58 which are linked together by a pair of side pieces or links 59. These links are pivoted about the support 60 for roller 57 so that the entire assembly may swing with respect to the cartridge on occasion, as when loading the taper, for example.

Tape 18 is secured to feeding means, in this case the tape feeding wheel 61, by adhering its sticky side 18S thereto. Tape feeding wheel 61 is slotted as at 62 in order to receive the blades 64 of the cutting structure. The cutting blades are supported by a carrier 65 to which the blades 64 are appropriately secured as by the cap screws shown in that figure. Carrier 65 is pinned to shaft 66, which is rotatably secured to the taping cartridge 19, in any manner (not shown).

A gear 67 may be seen in FIGURE 6 to be pinned to the tape feeding wheel 61 so as to cause the two to rotate together. It will also be seen in that figure that the pins 63 secure the various portions of the tape feeding wheel 61 to shaft 69. All of the portions 61 of the tape feeding wheel 61 are therefore driven whenever the gear 67 is caused to rotate. This gear 67 may be seen in FIGURE 4 to mesh with the gear 56 on shaft 55. Gear 67 may be also seen in FIGURE 4 to mesh with the gear 68 that is secured to shaft 66 so that the knife carrier 65 is driven in synchronized relationship to the tape feeding wheel 61.

In FIGURE 6 again, it may be observed that there are rollers 70 which rotatably embrace the shaft 69 and do not, therefore, have to rotate with the shaft but rotate about it. Spaced from shaft 69 is a shaft 71 to which a toothed driving roller 72 is secured. About the rollers 70 and 72 are reeved or placed the bands 74 which are toothed on their inner surface as to mate and cooperate with the teeth on the exterior surface of the driving roller 72. A gear 75 secured to shaft 71 meshes with gear 52 and is driven at a relatively high rate of speed whenever gear 52 rotates. Actually, the speed of the gears is important only in terms of the speed imparted to the tape feeding wheel and the tape releasing belts as explained below.

As shown in FIGURE 4, the belts 74 extend into the radial grooves in the tape feeding wheel 61 and it may be said therefore that the tape engaging surfaces of the

belts 74 intersect the tape engaging surface of the tape feeding wheel. In fact the two units intersect each other in such a manner that tape following the surface of wheel 61 automatically engages the bell 74 and is removed from the surface of the wheel 61 in order to follow the belt. In order for this to occur, the belts must move at least as fast as the tape engaging surface of the feeding wheel 61. As a matter of fact, since it is the sticky surface of the tape that is facing the belts, it is important that the tape engaging surface of the belts moves at a faster lineal rate than the tape engaging surface of the wheel 61. Comparing the gear ratios, gear 56 and gear 67 to the gear ratios of gear 75 with gear 52, it is apparent that the belts 74 are moving at a substantially higher lineal rate than the surface of wheel 61. For this reason, tape 18 is not only removed from the wheel 61 but fails to stick to any considerable extent to the belts 74, as they are constantly slipping with respect to the tape. The extension of belts 74 in a substantially straight line path away from the wheel 61 also provides a tape guiding structure. Tape 18 is so lightly tacked to the surface of belts 74 that when the belts circle around the driving roller 72, tape 18 is projected straight downwardly as shown in FIGURE 4.

Belts 74 may be made of any suitable flexible substance that is slippery, and plastics such as Teflon or silicone rubber are named as exemplary materials.

The tape applying structure may be seen to consist principally of a C-shaped member 76 which carries a C-gear 77. C-shaped member 76 and its C-gear 77 are journalled in frame 19 as shown in FIGURE 8. Bushings 78 are a means for providing free rotation of the member 77 within the frame 19.

Gear 77 meshes with two gears, one of which is designated 79 is carried by shaft 71, and the other of which is designated 80 and is secured to a shaft 81 suitably journalled in frame 19. Shaft 81 also carries the gear 82 that meshes with gear 52. Gear 82 is identical in size and tooth number to gear 75. The gears 79 and 80, therefore, are driven at the same speed. They are also of identical size and they mesh appropriately with the teeth of C-gear 77. C-gear 77, like the C-shaped member 76, is provided with an opening at one side in order to admit an item to be taped such as the bundle of wires 84 in FIGURE 4. As there is a gap in gear 77, it is necessary to have the two gears 79 and 80 to maintain constant rotation and synchronization of C-member 76. A yielding member 85, secured to C-member 76, provides a yielding pressure on the tape against an object such as the bundle of wires 84 when it is being taped. As here shown, the yielding member is a double C-shaped spring 85 the ends of which are suitably cut so as to allow the free ends to overlap each other as seen clearly in FIGURES 4 and 5.

When wires 84 are engaged by either being forced into the opening 22 or by having the cartridge moved toward them, they engage the sticky side 18S of the tape as shown in FIGURE 5. The tape sticks to the wires and is carried back into contact with the double C-spring 85, as shown in FIGURE 5.

At this stage of operation, trigger 25 is pulled and released which allows the driving mechanism to rotate gear 52 once. With the gear ratio illustrated here, the gears 75 and 82 are rotated four times in a single revolution of gear 52. There is produced, therefore, a similar number of rotations of the gears 79 and 80 and hence C-gear 77, as they all have the same pitch diameter. C-gear 77 does not, of course, have the same number of teeth as gears 79–80 because of the break in its structure to allow objects to be placed therein via the opening 22. Although a specific gear train is described here illustratively, others may be used, and the critical fact is to have C-gear 77 driven a whole number of revolutions for each impulse of the driving mechanism.

As shown in FIGURES 6 and 7, rotation of C-member 76 begins to wrap the tape around the wire bundle 84 and the tape is thereby pulled free from belts 74 and follows the outer surface of C-member 76 because of the speed with which it is rotating. Although four revolutions of C-member 76 are more than necessary to wrap the tape as shown in FIGURE 2, it is preferable to assure complete wrapping of the tape than to risk leaving an end that is not pressed tightly against the wire bundle. Because the gears 75 and 82 are whole number fractions of gear 52, a single revolution of gear 52 as driven by gear 51 will leave the tape applying structure 76 as shown in FIGURE 4 whenever the dog 40 stops the cam plate 38. As the tape feeding and cutting means is operated at the same time as the tape wrapping means is functioning, and this may be seen in FIGURE 7 for example, when the bundle of wires has been completed, a second piece of tape (which is illustrated in FIGURE 7 as having just been cut and started to follow belt 74) will be hanging across the opening of taping structure 76. As the non-sticky side 18N of tape 18 will be facing the bundle of wires 84 that are then completely wrapped with tape, however, they may be pulled out and simply brushed past the free end of the tape hanging down over the opening of the tape applying unit 76.

As shown in FIGURE 6, some of the gears are on the inside of the frame 19 and some are on the outside. Any gears that mesh with each other, of course, must be on the same side of the wall of frame 19 adjacent to the gears.

Spacer block 54 may be seen in FIGURE 6 to be suitably secured to frame 19 as by the countersunk screws 86. Any suitable means such as the spacers 87 and screws 88 may be used to secure the two sides of frame 19 together in properly spaced relationship.

It is apparent that many modifications and variations of this invention as hereinbefore set forth may be made without departing from the spirit and scope thereof. The specific embodiments described are given by way of example only and the invention is limited only by the terms of the appended claims.

What is claimed is:

1. A taper comprising a frame, a slotted tape feeding wheel rotatably mounted on said frame, means for sticking tape to said wheel or both sides of said slot, a knife means movably secured to said frame and geared to said slotted tape feeding wheel, said knife entering said slot regularly, a tape releasing means movably secured to said frame and having a portion thereof intersecting the periphery of said slotted tape feeding wheel, and means for driving said tape feeding, cutting, and releasing means in coordinated relationship whereby said slotted tape feeding wheel is driven at a slower rate than said tape releasing means.

2. A taper comprising a frame, a tape feeding means on said frame, means for sticking tape on said tape feeding means, a rotating tape cutting means cooperating with cutting tape while it is stuck to said tape feeding means, an elongated tape releasing means movably secured to said frame and having a portion thereof intersecting the periphery of said tape feeding means, continuously operating motor means, clutch means operably secured to said motor means and to said tape feeding, cutting and releasing means, and clutch control means secured to said frame and said clutch for driving said tape feeding, cutting and releasing means intermittently.

3. The taper of claim 2 in which said tape feeding, cutting and releasing means are secured to a separate frame relative to said driving means, said driving means is mounted in a housing, cooperating interacting position determining means secured to said frame and said housing, and releasible means for holding said frame and said housing in association with each other with the position determining means engaged.

4. The taper of claim 3 in which said cooperating positioning determining means are dowels and openings slidably receiving said dowels, and said releasible means is a headed, threaded member.

5. The taper of claim 2 in which there is a tape applying means adjacent to said tape releasing means comprising a portion of said frame extending beyond said tape releasing means and having an opening therein extending to its periphery, one portion of said frame adjacent said opening being pointed to facilitate the engagement of said taper applying means with the object to be taped, a C-shaped member rotatably mounted in said frame, means for stopping said C-shaped member with the open portion of said C-shaped member aligned with the opening in said frame, means for rotating said C-shaped member after tape from said tape releasing means depending in front of the opening in said frame has been thrust into said C-shaped member by an object to be taped being thrust thereinto carrying the tape with it.

6. The structure of claim 5 in which said C-shaped member is provided with oppositely disposed yielding means for pressing the tape against an object to be taped thrust into it and said C-shaped member is of substantially greater diameter than thickness.

7. The structure of claim 6 in which said yielding means have oppositely disposed finger-like projections which are interleaved.

8. In a taping device of the type in which portions of tape are precut to length and presented to a wrapping structure and having a frame including an opening extending to its periphery, the improvement comprising a C-shaped wrapping member rotatably mounted in said frame, stop means associated with said C-shaped wrapping member for stopping it with the opening of the C-shaped wrapping member facing the opening of said frame, means secured to said frame for rotating said C-shaped member in a controlled manner, and a pair of yielding members oppositely disposed within said C-shaped member for pressing tape against an object to be taped that is thrust into said C-shaped member.

9. A hand taper comprising: a frame, a supporting handle secured to said frame, a grooved tape feeding roller rotatably secured to said frame, means for orienting tape with its adhesive surface bearing upon the periphery of said tape feeding roller; tape releasing means including an endless belt movably secured to said frame and positioned so as to extend into the groove of said tape feeding roller; driving means secured to said frame and engaging said tape feeding roller and tape releasing means and driving the former at a lesser lineal speed than the latter; means including oppositedly disposed intersecting spring fingers rotatably secured to said frame for receiving tape from said tape releasing means and for winding said tape about an object to be taped.

10. A hand taper comprising: a frame, a supporting handle secured to said frame, a tape roll support secured to said frame; a continuously operating motor means secured to said frame; clutch means operably secured to said motor means; clutch control means secured to said clutch and mounted near said handle; gear drive means, rotatably secured to said frame and secured to said clutch means; a taping cartridge secured to said frame with an elongated transverse opening therein adapted to receive objects to be taped; a grooved tape feeding roller rotatably secured to said taping cartridge, said tape feeding roller being provided with transverse slots in the periphery thereof; gear means rigidly secured to said tape feeding roller and operably secured to said gear driving means; cutting means, including knife edges, rotatably secured to said taping cartridge and disposed so that said knife edges enter radially the transverse slots of said tape feeding roller; gear means rigidly secured to said cutting means and operably secured to the tape feeding roller gear means, the ratio of teeth therebetween being such that the knife edges of said cutting means intersect the periphery of said tape feeding roller only at the transverse slots thereof; an endless belt with internal teeth thereon movably secured to said taping cartridge and reeved in the groove of said tape feeding roller, so as to engage tape carried thereon; gear means engaging the internal teeth of said endless belt and rotatably secured to said taping cartridge said gear means being in engagement with said gear driving means and of such a tooth ratio therewith so that the lineal speed of said endless belt is greater than that of said tape feeding roller; tape winding means adapted to receive the tape from said endless belt and wrap said tape about the object to be taped including a C-shaped member rotatably secured to the tape cartridge; gear means secured to said C-shaped member and operably secured to said gear driving means the tooth ratio therebetween being such that the opening of said C-shaped member is always in alignment with the elongated opening of said taping cartridge when said gear driving means is at rest; intersecting spring fingers secured inside said C-shaped member adapted to yieldingly grip the object to be taped; and cam means secured to said cam driving means for stopping said gear driving means after one revolution thereof.

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